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ABSTRACT

The second of two volumes of a conference preceedings, this volume contains the preprints of five submitted papers, which are published as submitted by the authors: M. Broadbent and L. B. McIntyre, "Information Management: Promise and Reality"; E. Spoor, "Management Information from Library Systems"; R. Walsh, "Integrated Information Management: Some Practical Considerations"; and F. Austin, "A Library Network or a Computer Network?: Models for Library Co-operation Using On-Line Computer Systems Based on Database Technology." In addition, a paper entitled "On-Line Information Retrieval: Some Practical Experiences," which consists of three short papers: A. Wilson, "General Overview"; R. Cotter, "Online Searching in Science and Engineering"; and C. Skinner, "The Interlibrary Loans System at RMIT," is included. (DMC)

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VALA '83

SECOND NATIONAL CONFERENCE ON
LIBRARY AUTOMATION

INFORMATION MANAGEMENT

PROCEEDINGS
Volume 2

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LIBRARY AUTOMATION

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PROGRAMME COMMITTEE

Leigh Baker	Tony Mays
Barry Cheney	Geoff Payne
Virginia de Crespigny	David Richards
Hans Groenewegen	Doug Savige
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Victorian Association for Library Automation
GPO Box 2342V, Melbourne, Victoria 3001

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INFORMATION MANAGEMENT

PROMISE AND REALITY

by

Marianne BROADBENT
Senior Lecturer
Department of Librarianship
RMIT
124 La Trobe Street
Melbourne, Vic. 3000

(03) 341 2963

L. Barry McINTYRE
Senior Lecturer
Department of Librarianship
RMIT
124 La Trobe Street
Melbourne, Vic. 3000

(03) 341 2963

The theme of this conference is INFORMATION MANAGEMENT. Like most conference themes INFORMATION MANAGEMENT can be seen as a nice umbrella term which can be interpreted and applied in any number of ways. While this has some advantages it would seem that we have each brought to this conference very different notions of what we mean by INFORMATION MANAGEMENT.

When preparing for this session the vision of John Cleese discussing agenda items in Meetings Bloody Meetings[1] kept recurring in our minds. There the 'problem' term was COMMUNICATION. The meeting could not proceed as participants had prepared for discussion of a wide range of communication problems - the telephone switchboard, the inhouse journal and so on. The agenda item under discussion could equally as well have been INFORMATION MANAGEMENT.

Imagine if this conference were being held under the auspices of the Australian Institute of Management, the Australian Computer Society or a group of sports writers, social workers or lawyers. It would not, in our view, seem unusual for any of these groups to hold a conference on this same theme of INFORMATION MANAGEMENT. This is not a criticism of the conference theme, which we think is very timely, but an illustration of the pervasiveness and acceptance of the role of 'information' and the many different ways in which the term INFORMATION MANAGEMENT can and is being used.

INFORMATION MANAGEMENT: different perspectives

We would like to look first, then, at what might be meant by the term INFORMATION MANAGEMENT. In the literature of librarianship, particularly special librarianship, the term is being used interchangeably with the word "librarianship".[2] The advertising brochure for this conference alluded to a somewhat wider notion of INFORMATION MANAGEMENT when stating that

> "Many important developments are currently taking place in library and information automation. ...These developments have broadened the emphasis of traditional

> library and information-retrieval activities which may now be viewed in the wider perspective of the management of information in its various forms."(3)

But to be content with even that "wider perspective" is to deal with only one dimension of INFORMATION MANAGEMENT.

According to Donald Marchand, the aim of INFORMATION MANAGEMENT is

> "... to promote organisational effectiveness by enhancing the capabilities of the organisation to cope with the demands of its internal and external environments in dynamic as well as stable conditions."(4)

Management of data resources of an organisation may be seen as one dimension; *management of the information process* is another. *Management of the information process* has to do with

> "... how well the members of the organisation interact with the data resources and supporting technology for decision making and analytical purposes. The emphasis of this dimension is on the *value* of resources that are used in the organisation."(5)

Management of the data resources, on the other hand, emphasises "control of the *physical* manifestations of the organisation's information process."(6)

At a conference with the theme INFORMATION MANAGEMENT sponsored by an association for library automation we might well ask which dimension of INFORMATION MANAGEMENT is of primary concern?

- the management of the information process?
- the management of the data resources?
- both?

If we are content and comfortable with the means, *management of data resources*, and not the end, *management of the information process*, to which group of people do we defer in the information management

process?

When speaking about the 'new career path' of INFORMATION MANAGEMENT and INFORMATION RESOURCES MANAGEMENT (IRM) to ICI's Company Information System Managers in April 1983, Blaise Cronin described a situation which is becoming increasingly familiar to many of us, particularly those living in Victoria:

> "Already, there is shuffling in the wings as communications experts, data processing managers, librarians, MIS people, systems analysts, information scientists, marketing personnel, records managers and computer scientists covetously eye this virgin territory and wonder how to stake their claims."(7)

How has this 'new career path' developed? How was such 'virgin territory' discovered? What claims have so far been staked in Australia and elsewhere? What are the implications for those in the library and information workforce in Australia?

Evolution of INFORMATION MANAGEMENT

INFORMATION MANAGEMENT, defined as both the *management of the information process* and the *management of data resources* has evolved from the coalescence of a number of interrelated factors:

- recognition of the importance of information to organisations and individuals
- improved access to the information resources of governments
- attempts to reduce the burden of paperwork, particularly in the public sector
- the convergence, availability and utility of information handling technologies.

The early literature of INFORMATION MANAGEMENT, particularly INFORMATION RESOURCES MANAGEMENT, reflects a concern to manage the whole of the "Information Life Cycle" from "requirements definition" through to "use" and a restatement of "requirements definition" (See Fig.1).

Information Life Cycle

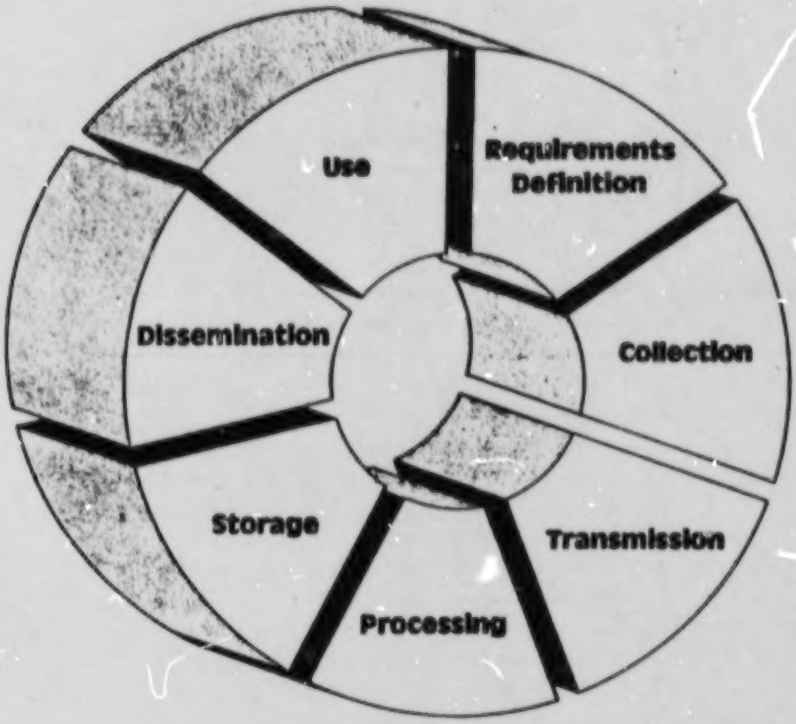


Figure 1.

More recently, writers such as Levitan[9] and Black and Marchand[10] have rightly claimed that this simple and sequential view of the 'information life cycle' is somewhat misleading. The full information life cycle should be seen as much more complex and permuted. Particular activities in the information life cycle cannot be viewed in isolation.

Thus while information technology has enabled more integrated approaches to the *management of data resources*, have we developed, or even recognised the need for a holistic approach to the *information management process*? Has our attention been focused on structures, inputs and technological capacity rather than values, outputs and the use to which information is put?

The all-embracing character of what is proposed by information management perhaps is best captured if we list what its proponents see as the functions to be performed by IRM staff and the operations encompassed under its umbrella.[11]

Functional responsibilities commonly include:

1. technical advice to the management chain;
2. standards and guidelines for audits of all major information systems and data bases in the organisation;
3. design and development of IRM management tools;
4. direction in applying information technologies to the organisation;
5. coordination of organisational plans and budgets for information resources;
6. inventories of information resources; and
7. identification, for sharing economies of scale and avoidance of unnecessary duplication.

Typical operations for considered inclusion under IRM are:

1. information systems coordination;
2. computer/telecommunications procurement;
3. operations control;
4. standards;
5. forms, records and reports management;
6. statistics gathering and analysis;

7. data reduction;
8. data base management;
9. library and information services;
10. security;
11. printing and reprographic operations; and
12. communications technology.

The essential change in direction is not so much the application of systems and management approaches to information operations but rather the need to view the management of information on a broad scale. Moreover, the recent emphasis is to concentrate on viewing information as a resource which should not be considered as merely an "overhead cost" or "free good". Not surprisingly, the major evolution of information management practice has occurred in large organisations in both the public and private sectors.

We would now like to examine some of the responses of governments, libraries and the information professions to the coalesence of the interrelated factors mentioned above from which INFORMATION MANAGEMENT evolved. The discussion of rhetoric and reality must necessarily draw upon examples from public administration. Although the interest and contribution of major corporations and consultants in the private sector has been substantial, relatively little published information concerning the realities of implementing holistic information management is available.

Information management concerns in public administration

United States

Certain events in recent Federal administrations gave impetus to those advocating a holistic information management philosophy. Some of the principal stimuli[12] included:

- the establishment and work of the U.S. Commission on Federal Paperwork during the late 1970's;
- the definition and publicity given to the development of national information policy issues by the executive branch of Federal Government; and

- President Carter's Reorganization Project and its recommendations concerning the management and use of information technology in achieving federal goals.

These initiatives together with the lobbying activities of organisations such as the Information Management Association, influenced Congress and secured the passage of PL 96-511 The Paperwork Reduction Act of 1980. In part the Act endeavours to placate those of small government and laissez-faire persuasion who call into question the data gathering burdens which modern government seems to increasingly impose on citizens and corporate bodies. Implicit in the legislation is the notion that information programs of government should no longer be viewed as "free goods" that are not amenable to resource management techniques. The contribution of these developments to the definition of information management is important because they focus attention not only on the "how to" concerns of information technology but also on more substantive questions of why information is collected, why it is used the way it is, and what value it has in the advancement of institutional goals and objectives.

It is difficult to judge yet whether the rhetoric of information resources management is going to eventuate in tangible and lasting initiatives in the U.S. Civil Service. Certainly some of the framework has been established. For example, the monitoring authority, the Office of Information and Regulatory Affairs, has been established by the Office of Management and Budget so that information management concerns reside near the focus of bureaucratic power. The Federal Information Locator System is being developed to identify the extent of existing information systems controlled by the national government.

In early 1982, 66 major information resource programes investigating the activities of 26 agencies of government were announced. These were considered to be high-priority projects. A wide variety of concerns was apparent. Technological imperatives such as telecommunications, automatic data processing and improved technology generally figure prominently. Nevertheless, other resource management

and public policy issues are obvious: improved service delivery; budget savings; improved agency productivity; reduced public paperwork burden; and the elimination of federal information activities that duplicate private sector services.

These initiatives are likely to impinge on the general environment in which libraries operate. Already, for instance, there has been a significant cutback in the level of titles produced by the Government Printing Office. Some of the review programes have been directly concerned with libraries. In the National Library of Medicine the operation of Medline has been reviewed to ascertain whether it could be eliminated because it duplicates private sector programes. The Department of the Interior is assessing the use made of its library programes as a step towards improving their management. Other federal information centres, including the Departments of Defence, Interior and Education, were also subject to use studies. Several of these reviews were again concerned with whether private sector involvement was to be preferred.(13)

In this environment it is not surprising that new vocational groups, such as federal information managers, have emerged. The concern within U.S. public administration to harness information at a federal level is evident too now, at other levels of Government. The programs and projects of the Bureau of Governmental Research and Service at the University of South Carolina, for example, are illustrative of broader information management investigations at state and county levels.(14)

Canada

Canadian interest in enhanced information in public administration, like its U.S. counterpart, has been driven by the ever-increasing quantities of information and the problems of adapting to the integrative capacities offered by changes in computer and communications technology. The role and management of information in national affairs was addressed as early as 1969 in the landmark report of the Task Force on Government Information 'To know and be known.'(15) Yet, despite this relatively early expression of interest, Canadian initiatives have not been as

comprehensive as those in the U.S.

Much of the evolution of Canadian information policies has involved the Treasury Board. In 1974 the Board issued the Guide on EDP Administration followed in 1977 by the Guide on Telecommunications. A Canadian government study on the Management of Recorded Information was conducted in 1978. This study concentrated on EDP, telecommunications, word processing, micrographics, records and forms management and library services. There was the 1978 Cabinet decision to reduce the paper burden that government imposed on business.(16)

One imperative to improved information management is the anticipated proclamation of the Access to Information and Privacy Acts in 1983. The Task Force on Access to Information is charged with the establishment of administrative machinery across the Canadian public service to assist with the implementation of these Acts. Taken in isolation the work of this Task Force has little interface with the general principles and practices of information management. However, the ability to respond to requests under the proposed legislation presupposes a sound records management program. The responsibility for this initiative is vested in the President of the Treasury Board who has to keep under review the manner in which records under the control of government institutions are maintained and managed. The Board has developed a new records management policy for the federal government and each government Department has a designated Information Manager.(17)

From the titles of other Chapters in the Administrative Policy Manual to be released in 1983, such as access to information and privacy, inventory of information, information collection, micrographics and management of EDP data, it is obvious the Canadian federal government is moving toward an explicit information resource management philosophy. Nevertheless, Robert Jelking, Director, Task Force on Access to Information and Privacy, observes that the approach has not been an integrated one. That is, the building blocks have not yet been integrated into a comprehensive policy that would link all stages in the information life cycle, from acquisition to disposal.(18) While

there has been internal discussion of such an approach inside the Canadian bureaucracy, the resource management approach evident in many of the current U.S. investigations is yet to materialize.(19)

As in the United States the Canadian experience reveals a remarkable shift in the character of information related policies. The initial policies were more likely to focus primarily on the technical means of processing and tranforming information. More recent policies such as those resulting from Part IV of the Human Rights Act 1978 not only address the full life cycle, that is the collection, response burden, access, utilization, storage and retrieval, but also the relationship between the government institution and the public as well as professional and administration standards for the collection of information.(20)

Australia

In Australia, at the level of the federal bureaucracy, the concern with national information policy and the evolution of a resources management approach to information can be characterized as variable. There is much less unity in practice despite general recognition of the importance of information and information-handling technology.

In its report of 1978, the Royal Commission on Australian Government Administration recommended that an investigation be conducted into the way Government Departments provided information to groups and individuals in the community. The resulting Task Force on Departmental Information was established in 1979 and made its report in 1980. Although it was not as comprehensive as some of its North American counterparts some of the Task Force's recommendations do contain the seeds of an information resource management approach to public administration. For instance, the Task Force recommended that each Department should produce an annual information plan endorsed by top management and approved by the Minister. The plan should cover, for each activity, objectives, targets, communication channels, resource allocation, progress to date and evaluation. It was recommended that such a plan be reviewed regularly and developed in connection with

forward financial estimates and sent to the Department of Finance.(21) The report though was primarily concerned with the dissemination of information rather than managing the full life cycle of information in public administration. One must also remain sceptical of current commitment to many of the Task Force's recommendations when it took two years for the report to be published.

In Australia, Freedom of Information legislation, as well as an associated Archives Statute has some ramifications that require more effective management of Government documentation and information resources. To date, however, there has not been explicit concern to review information management on a life cycle basis. In addition, there has been little attention paid to the paperwork reduction dimension inherent in overseas initiatives. Explicit responsibility concerning information management policy and evaluation has not been delegated to a central and powerful arm of executive government, nor has there been legislation that necessitates a direct commitment by the federal government to practice information resources management as recently required in the United States.

Within public administration in Victoria some of the same threads apparent elsewhere have provided some stimulus to improved information management. In 1978, a Task Force on Records Management was initiated.(22) As its title implies the principal focus of this investigation was the archival costs of managing the rapidly expanding volume of Departmental records. The adoption of State Freedom of Information Legislation in 1982 has given an additional fillip both to the issue of access to and management of government information. A State Inter-Departmental Committee (IDC) has also been concerned to facilitate the coordination of Departmental information. One of the tangible results of this Committee has been the identification of data elements collected by the State government.

It is apparent from a reading of the Report of the Inter Departmental Committee on the Implementation of Freedom of Information legislation that the introduction of the legislation in Victoria involved not only political

issues of access, but also an opportunity to revitalise information management in public administration.[23] The State government has adopted and implemented an IDC recommendation that a new position of INFORMATION MANAGER be created in the Victorian Public Service.

This brief review of information management concerns in public administration has tended to emphasise the role of external stimuli in the form of legislation. We should be mindful that some government agencies seem to be working towards management of the information process regardless of these developments. At a National level the movement towards holistic information management is apparent in the evolution of the CSIRO's Central Information Library and Editorial Service. At a State level the Victorian Department of Agriculture appears to be one of the leaders in integrating information technologies as well as assessing the value of its information products.

Library automation and INFORMATION MANAGEMENT

In what ways can libraries be viewed in the INFORMATION MANAGEMENT context? As units for the management of a certain type of data resource? As integrated components of the information management process of an organisation? Or a separate entity with different systems managing a discrete data resource?

Libraries were relatively early users of information technology, particularly in the life cycle areas of storage and dissemination. In larger libraries, discrete systems were developed for the management of data in different functional areas such as circulation and cataloguing. Today, the availability of more integrated systems is beginning to have a dramatic effect on the library and information workforce, on the management of library services and on network and cooperative activities amongst different libraries and library systems.

Can we say that "Organisational effectiveness" as referred to earlier by Marchand[24] has been both our aim and our achievement? Or have we been using powerful information technologies in a less than powerful way? As information professionals, how sophisticated and adequate are

our decision support or management information systems? How do we as librarians rate as INFORMATION MANAGERS of our systems? How easily and effectively for instance, do we collect, organise and use library statistics?

In a Harvard Business Review article published in 1979 Nolan[25] examined the use of computers in organisations and plotted the progression from computer to data resource. Three stages of "user awareness" were identified: 'reactive', 'driving force' and 'participatory'. It may be worth looking at Nolan's stages of "user awareness" where data processing is concerned. You may then like to contemplate at which stage or stages you think most library services are currently operating:

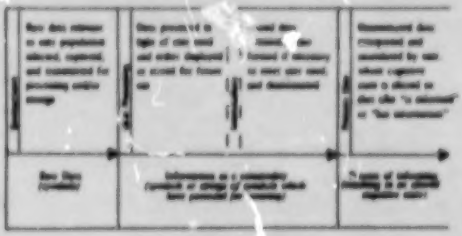
> "Reactive: End user is superficially involved. The computer provides more, better and faster information than manual techniques.
>
> Driving force: End user is directly involved with data entry and data use. End user is accountable for data quality and for value-added end use.
>
> Participatory: End user and data processing are jointly accountable for data quality and for effective design of value-added applications."[26]

We will leave it to you to establish whom you think the "end user" is or should be in this context.

Earlier mention was made of Blaise Cronin's comments about the range of information professionals beginning to stake a claim in the information management or IRM areas.[27] What different perspectives can be gleaned from the variety of people who might be identified as professionals in the information field? What is the information-orientation of these different groups? Where do librarians fit into the picture?

Information and information professionals

The difficulty of defining which group or groups of workers might be classified as "information professionals" is well illustrated in The Information Professionals : Survey of an emerging field.[28] Debons[29] and his fellow researchers developed a model of an "information system" (Fig.2) from two definitions of information: one *source-based* (the commodity of information) and the other *receiver-based* (the process of information).



An Information System.

FIGURE 2

Three levels of information systems, based on the complexity of *content*, and therefore the effort required to facilitate processing and interpretation were then identified. Examples of the most complex Level 3 information systems were libraries, commercial databases and clearing-house systems. Management information systems, command and control systems were seen as less complex Level 2 systems, with systems involving limited routines and clearly specified procedures, such as payroll and inventory control, being Level 1 systems.

In an attempt to assess the value of information in organisations Black and Marchand[30] identified six approaches to the study of information : information technology, information/library science, information resource management, value/burden organisational theory and economics of information. Black and Marchand claim that these approaches inhibit a dichotomy between a discrete and a dynamic approach to the creation, transmission and application of knowledge. This dichotomy is evident in the way in which information is defined, perspectives on the informational life cycle and the relationship between the transfer and final use of information. The first four approaches have a "functional"

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interpretation of information, while the last two have a "process" interpretation.

Black and Marchand claim that the information/library science approach deals with only the storage and retrieval stages of the informational life cycle, with the unit of analysis being recorded data. Information resources management and organisational development approaches on the other hand deal with all stages of the informational life cycle. But IRM exhibits a functional approach to information while organisational development exhibits a process approach.

Black and Marchand end their essay on the value and use of information with the comment that

> "there is ... the nagging suspicion that enhancing the value of information in public or private organisations may be only marginally improved by the introduction of new technologies and information technologists. A basic reason for such pessimism resides not only in the 'newness' of our conceptual and applied knowledge about the relationship between information, decision making and power in organisational settings."(31)

You may well ask what this theoretical background has to do with looking at the 'new career path' and 'virgin territory' of INFORMATION MANAGEMENT? From our viewpoint it is very helpful in developing an understanding of current landscape, vegetation, wildlife and habitability of that 'virgin territory'. With that understanding we may be better placed to husband the opportunity presented for the community and for ourselves.

Librarians and INFORMATION MANAGERS

While librarians may try to use the term "Information Manager" as a synonym for 'librarian', the reality is that librarians are but one group of information workers amongst many who feel that they have a claim to such a title. The private sector has been using the term for some time with a variety of meanings. That flagship of our mixed

information service and product economy, ACI Computer Services, has been using the term INFORMATION MANAGEMENT as the heading for its AUSINET advertisement in Incite for the past eighteen months.

As mentioned earlier a new position of INFORMATION MANAGER has been created in the Public Service in Victoria. We thought it would be useful to look at some aspects of the profile for this position, at the background of some of those who have been appointed to these positions and the implications of this development for INFORMATION MANAGEMENT.

Duties of the position were advertised as

> "Under direction to develop and advise on an information resources policy for the agency; to co-ordinate the application of systems and procedures for the management of the agency's information resources; to be responsible for the implementation of arrangements for access to the agency's records; to be responsible for liaison with co-ordinating agencies in the areas of information systems and methods, freedom of information and privacy matters, records management and disposal."(32)

Mandatory qualifications required were listed as:

> "1. A good knowledge or appreciation of modern technology to the management of information as a resource.
> 2. Ability to develop, implement and monitor management information systems particularly with respect to cost savings.
> 3. Demonstrated ability to conduct investigations, prepare policy recommendations and reports and plan work programmes.
> 4. Ability to interpret and administer legislation related to management of information resources."(33)

Amongst the "other" qualifications seen as desirable was "appropriate experience related to records management or EDP systems or libraries or organisation and methods or in management review or other related

administrative discipline."(34)

To date, 28 of these positions have been created. From the information available to us, three are currently filled by personnel with a librarianship background; three are former archivists and eight have either "methods" or EDP backgrounds.

It remains to be seen how successful the initiation of these positions will be in promoting information resources management in local administration. While it may be gleaned from the position profile that management of information in the full sense is envisaged, the incumbents are responsible both for administration of Freedom of Information (FOI) and information management. Apart from the resource difficulties of satisfying both charters, such officers are likely to suffer a double dose of institutional backlash both from FOI as well as resistance from existing vested interests to a more comprehensive resources management approach to information. Given the administrative level of existing information managers it seems unlikely that significant information policies will result in the short term.

Other inherent weaknesses in the existing attempts to improve information management strategies of the Victorian Government include the absence of a permanent delegation to coordinate information management across departments and statutory authorities; the lack of any explicit review of information programs from an information resource management perspective in the budget appropriation cycle; and the reluctance of the Cain government to commit additional resources to improved information management programs.

Making the transition

How well placed are librarians to make the transition to INFORMATION MANAGERS? What skills and experience are required of those who wish to move from institutionalised information services to a new corporate role?

Cronin suggests that a "fresh enthusiasm" is required if the traditional

information profession of librarianship is to "colonise" the new territory of INFORMATION MANAGEMENT. An emphasis will be placed on technology, interpersonal skills, marketing, diagnostic skills and the ability to evaluate and manage using mathematics.(35)

Strategically, how well placed are librarians to accomplish this shift? Although some have already made the transition, and doubtless others will, one has to be pessimistic about the group prognosis for several reasons.

Information management is ostensibly practised in large organisations whether they be in the public or private sector. In such bureaucracies librarians currently have low organisational status. The feminised character of the profession also does not enhance its prospects in any stakeout.

The library profession does not have a strong tradition in marketing which is going to be required in information management. Also libraries have not been noted for their interest in evaluation, performance assessment or cost-benefit analysis. In part this no doubt reflects the predominant background of librarians who are drawn from academic disciplines in the humanities and social sciences.

Most librarians are also relatively inexperienced in integrating information technologies and in the development of information products. To what extent are those with librarianship backgrounds involved in information utilities, in the information technology industry, in organisations acting as database vendors in Australia and as either public or private funded database producers? While there has certainly been some movement of librarians into this area, has the extent of the involvement and evolution here been in the same proportion as the opportunities available to, and seized by, other information sector workers?

In outlining the professional services offered to libraries and information centres by private sector organisations in the U.S., King and Croager made the point that by 1980, about 40 per cent of nearly 200 federally funded information centres were entirely operated by private organisations and many of the remaining 60 per cent contracted out at least a portion of their operations.(36) They also note that much of the capability to create fully-integrated library systems using computer technology has come from private enterprise with libraries as clients. Is it thus probable that corporate INFORMATION MANAGERS are more likely to be drawn from the personnel of information utilities than from the personnel of their client libraries?

From a philosophic viewpoint is the profession well placed to make the transition to information management in both the private and public sectors? Much of the prevailing discussion of information management in public administration emphasises the need to question the concept of information as a "free good". Although this does not mean that fee based services necessarily need apply, the professed spirit of librarianship has tended to be antithetical to fee-for-service and to cost accountancy for that matter.

Information resource management employs a variety of techniques. One cluster of techniques are data inventories. Other systems approaches include information flow analysis and information environment analysis. Most libraries are not of sufficient size to supply opportunities to practice such techniques. In larger libraries there is little evidence that these approaches have been employed internally. Automated management information systems are in their infancy in libraries. Moreover, rarely have large libraries endeavoured to define in detail their information management roles and responsibilities within their broader institutional framework.

On the positive side, it is important to note that librarians and their professional associations here and in other countries have been in the forefront of lobbying activities for state and federal information policies and for FOI and copyright legislation aimed at improving

access to information sources for our clients. Librarians have also had an impressive record of concern for ethical matters - a concern which has only recently surfaced amongst information scientists.[37] From our experience with other information professionals, librarians do possess some of the basic skills required of INFORMATION MANAGERS. But these need to be practiced with more flair and less timidity.

In our view the task of INFORMATION MANAGEMENT requires a mix of competencies, personal and professional skills and informational orientations. Perhaps an interdisciplinary team needs to be clearly identified and nurtured in organisations if the purpose of INFORMATION MANAGEMENT as identified by Marchand, "to promote organisational effectiveness",[38] is to be realised. This has always been, or has developed into, the approach in some organisations where the value of information is fully appreciated.

If those of use with education and experience in librarianship wish to be involved in the area being identified by non-librarians as INFORMATION MANAGEMENT we must be prepared to move into a much wider and more risky environment. The environment is less secure and may cause some discomfort as the structures and ground rules are still emerging.

It is also important to note that all of us working in libraries need to clarify what business we are in. As other information professionals who claim an understanding of the INFORMATION MANAGEMENT process are appointed to large organisations, libraries, particularly those in tertiary institutions and some public libraries will increasingly have to account for their sphere of activity and responsibility. In most cases the INFORMATION MANAGERS appointed in the Victorian Public Service are senior to and paid a higher salary than the department or statutory authority's senior librarian.

In conclusion, might we illustrate the extent to which the librarians, information scientists and systems people who develop and maintain our

databases are in the forefront of INFORMATION MANAGEMENT developments. When we were preparing this paper, in mid-1983, the term INFORMATION MANAGEMENT was not yet a descriptor in ERIC, though it had been used as an identifier on 16 occasions since 1966. The term INFORMATION MANAGEMENT has been used as neither a descriptor nor an identifier in Library and Information Science Abstracts (LISA)!

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MANAGEMENT INFORMATION FROM LIBRARY SYSTEMS

BY

ELIZABETH SPOOR Circulation Librarian

T L Robertson Library

W A Institute of Technology, Kent Street, Bentley W A 6102

ABSTRACT

Ability to obtain the kind of information from computerised systems which could lead to more informed decision has been seen by business and industry as a major benefit of automation. This benefit has not yet been widely applied in libraries.

Experience in using and improving WAIT Library's acquisitions and circulation systems developed an interest in the possibilities and problems in using the information from these systems to make more informed decisions. In 1980 a three-month study leave in Ontario, Canada gave me the opportunity to study automated systems in four university libraries, to observe how systems had changed and developed, and what use was made by library managers of the information available to them.

This paper outlines some of the benefits business and industry claim to derive from management information systems, and their potential use in libraries. It considers the opinions and problems encountered in Canada in 1980, describes the attempts at WAIT to link information in the acquisitions and circulation systems, and concludes with a discussion of some of the difficulties in using the information to improve decision-making.

MANAGEMENT INFORMATION FROM LIBRARY SYSTEMS

Management Information Systems (MIS) have become part of the business world in the last two decades, although their acceptance has not been without question, and their spread has not been universal. However they are sufficiently a reality to have become the subject not only of learned articles but also of textbooks, and MIS appears on the curriculum in many Business Schools.

There is no easy definition of a Management Information System; the concept includes the acknowledgement that computers are more than 'number-crunchers' and have other purposes besides making clerical procedures more efficient and accurate. MIS stems from the systems approach to computer development which sees the whole as more than the sum of its parts, in computing terms, and advocates an approach to systems development which stresses integration and interdependence to capitalize on automation. An attempt at definition appears in the 'Encyclopedia of computer science and technology'. This states that MIS is 'A set of formalized rules and procedures designed for transforming data into information to aid in managing an organization toward achievement of its desired goals'.* The key words in this definition are 'transforming data into information' and 'aid in managing'. Management Information Systems attempt to provide the manager with what he needs for decision making in a form that synthesises and organizes data, rather than allowing it to overwhelm.

Librarians, in spite of the interest the profession has in 'information' in all its forms have not shown a great deal of enthusiasm for MIS to date. There have been some voices speaking for the usefulness to libraries of installing such systems, and in the USA pleas have been made for the standardization of data collection to the extent that a national library MIS might be developed.

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* Belzer, J., Holzman, Albert G., and Kent, Allen
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Vol.10, 1978, p.206

However there are basic differences between libraries and business organizations which make widespread introduction of management information systems of an elaborate nature unlikely.

Firstly, libraries are not attempting to make a profit, but are providing a service. Although the concept of 'user pays' is not unknown in library circles, and although subscription libraries remain within the memory of many practising librarians, the object of the modern library is to provide as good a free service to a variety of users as is possible within the constraints of funds available. These funds are frequently provided by governmental or quasi-governmental organizations, and the level of funding depends not on the profit made by libraries or on some strict economic measure, but on the state of the country's economy and a nebulus feeling about the worth of libraries to the community.

This dependence on funds not as a general rule associated with excellence of performance, and not generated by the products or services provided by the library, creates a fundamental difference in approach to services and 'products' between libraries and commercial organizations.

Whereas a business is dependent on its offerings being produced at the correct price for the appropriate market and meeting with success or failure which can be measured in economic terms, a library can rely on some degree of funding whether it performs efficiently or not, because it is now established as a part of the package of services expected by the community.

Recently, with the downturn in the economy in the western world, libraries have been increasingly called on to justify their cost. This has proved embarrassingly difficult to some.

The nature of the decisions to be made in libraries differs too from those made in the business world. On the one hand the library Manager has less freedom to manoeuvre, change direction and take risks; on the other hand decisions are made in a far less pressured environment and, while not denigrating librarians, many of their decisions are of far less moment.

The scale of operations and their complexity also affects the need for sophisticated information systems; most libraries remain relatively small operations, with relatively unsophisticated requirements.

In spite of the emphasis placed so far on the slow development of MIS in libraries, it is not true to say there has been no interest in their potential and it does seem likely that the next decade will see librarians who will be increasingly called upon to account for the funding they receive turning to computers for help in budget justification.

An interest in the wider application of its automated systems has always been present at WAIT Library, but the way the systems have developed has made achievement of anything approaching an MIS frustratingly slow. The history of systems development at WAIT is one of in-house systems, which have been developed in a fragmented fashion. It was understood from the earliest days of the library that where it was both advantageous and possible, manual systems would be replaced by computerized systems. However, in the early 1970's there were few attractive software packages capable of being run on the Institute's DEC 10 computer and available to libraries in Western Australia. There were few systems analysts or programmers in Perth with any real experience of designing library systems and progress in library automation was governed by these factors. Early efforts were in the technical services area where the first system to operate (in 1971) was an Acquisitions ordering and accounting system. This system operated in batch mode, produced orders on multiple part stationery, and had the capacity to produce follow-up reminders and several reports on committal and expenditure of funds.

This early system was interesting in that it reflected the desire of the library management for information over and above that necessary simply to order, receive and pay for items of library material. Thus reports, were available not only for the usual 'committal and expenditure' figures, but also on:

- Average prices within particular funds

- Committal accuracy. (This report printed out all orders in which the difference between committed and expended prices was over 20%, tabulated the orders according to percentage of difference and tabulated variations by supplier.)

- Analysis of delivery times. (This report could be produced for a particular fund or supplier. It showed, within those parameters, the number of orders placed in a specified period and the number still outstanding. It gave a frequency distribution of delivery times and the average delivery time and, if required, listed the outstanding orders for a particular time span.)

- Analysis of orders by subject.

This provision of fairly sophisticated analysis in the system design contrasted with the development of the WAIT Library Circulation system, which took place some years later.

The Circulation system at WAIT Library was designed and implemented in 1979/80 in less than ideal circumstances. By that time loans had been increasing at WAIT Library steadily at first and then more rapidly than was manageable. The Institute had imposed staffing restrictions on the library, and the manual loans system had been simplified as far as possible without losing control completely. The case for an automated loans system was strong, but the library systems staff were fully engaged on the work required to produce the library catalogue microfiche by a target date of January 1980.

The library gained the support of the Institute's Administration in arguing for an automated loans system, and funds were found to employ a firm of computing consultants to design a loans system. In spite of the library management's continued interest in management data, and the fact that Circulation systems can produce much valuable information, the funding reality was that what could be afforded was a bread-and-butter loans system which charged and discharged books, and allowed for other routine library operations such as renewals, recalls etc. Statistical information was provided in a routine, stylised fashion, and came in the form of daily, weekly and monthly transaction totals.

This situation had to be tolerated while the system was implemented and until library systems staff were able to turn their attention to enhancements. These at first concentrated on improving service to users, but in due course statistical reporting assumed priority.

It was first decided to reduce the production of routine reports to a minimum. The facility to produce daily reports, for example, is provided in the system but they are only produced on request, perhaps to illustrate days of peak activity or to provide data on use of the library on Sundays or Public Holidays. Reports can in fact be produced on request, for any specified period. The library required monthly statistics from all sections, so these are produced routinely by the Circulation system, as are year-to-date cumulations.

Format as well as frequency of the reports was altered, so that they are now readily comprehended by any member of library staff who needs to examine them.

Reflection of the loans activities of a library is provided by these basic loans statistics, but in addition loan transactions contain other potentially useful and interesting information on patterns of borrowing and use of material. The potential for finding this kind of information from circulation systems has always been recognized, but has been impossible to obtain from manual systems without tremendous labour costs.

Having the information in a computerized format but lacking programs to analyse the data proved to be a frustration to library management for the next two years. At WAIT Library the Principal Librarian has a considerable interest in in-library research, and a Research Librarian was appointed in 1980. Knowing who borrowed from the library and which items were most frequently borrowed seemed to be fundamental to most investigations conducted by the library, but this need was not met by the loans system, in spite of the article in The Australian of January 20th 1981 headlined "Datec brings on-line management to WAIT Library". For one research project the need was crucial and so two simple analysis programs were hastily written to extract information about the use patterns for text books for particular units conducted at WAIT. Use of the programs revealed that archiving of loan transactions had been given insufficient attention, and that there could be little expectation of complete information accuracy. Analysis of loan statistics was delayed until June 1983, when a new suite of programs was designed. These programs produce "Book activity" and "Borrower activity" reports to particular specifications. The user may specify one or a specific group of books or borrowers and the loan activities of that individual or group of items or people is then analysed. The user must specify whether the analysis should cover loans from the General Collection or the Reserve Collection and the period of time to be covered.

Reports are produced in a variety of sequences, for example 'As input', in Author order, in Surname sequence. As well as being printed, the reports can be output onto a computer file for further manipulation, e.g. by SPSS (Statistical Package for the Social Sciences).

These new information programs will be useful in providing information for a variety of practical applications:

- In replacing missing books; an analysis will be done to show the borrowing history of all copies. This should help in the decision about buying a replacement.

In assessing sections of the collection for weeding, an analysis will be done to show which books have been borrowed many, few or no times. This should indicate which books might be considered for disposal.

WAIT systems do not at present seem to be at a suitable stage of development for the devising of a generalized MIS. Information about rates of work or costs of particular activities such as acquiring or cataloguing material can only be obtained in a time-consuming, laborious way. It has been decided that this sort of information is not required on a regular basis, and will be collected and examined only at critical times, for example, prior to and after a significant change in methodology or after a sizeable budget increase or reduction. Methods for obtaining unit-cost figures for activities in both Acquisitions and Cataloguing departments have been devised and will be devised for other areas of the library when time permits.

Where useful links between systems can be implemented, however, they will be. The link next planned for is one between the Loans and Acquisitions systems. Information gained will be used in attempting to relate budget allocation to collection use.

Some of the recent developments at WAIT, and some plans for the future, have been influenced by experience gained by me on a study tour in Ontario, Canada in 1980. The purpose of the study leave was to visit four academic libraries similar in size to WAIT, which had introduced automated systems, to see how the systems had changed and developed and how the Library Managements used the information available from their settled, well-established systems. I particularly wished to visit Guelph, having heard Mrs Beckman speak at the LAA Conference in Melbourne in 1977, and the other libraries were chosen largely on the basis of their size, similarity to WAIT and nearby location.

A personal discovery was made, which in retrospect seems very obvious and inevitable, and that is that the dynamic nature of the computing world meant that much of the energy and ability of librarians and their systems colleagues was expended on continual proposals for and adaptation to new hardware and software, as original systems became outmoded and were superseded by new developments in the computing industry. The situation as pictured from Perth had been one of libraries in North America, earlier on in the automation scene, having moved into a more settled phase of systems development, where the basic systems ran smoothly and the library management was able to concentrate on using the data captured by their systems in a wide variety of managerial functions.

I found I had been wrong in this expectation and that the technology of computing still dictated to a large extent the directions taken by the libraries in their systems development. Each of the libraries visited had a difference in approach and all were at different stages in their systems development. At Guelph, for example, early batch-mode systems had been or were being replaced by on-line systems. The library had become involved in a business association with a computing company, GEAC, and had collaborated with them in developing both its Circulation and Acquisitions systems, which were then marketed by GEAC.

At York University in Toronto, there was a more diverse approach to systems development, with a combination of in-house design and programming, and the purchase of turnkey systems. York was a user of the UTLAS Cataloguing Support System, and was the only library visited using UTLAS.

And at Carleton University in Ottawa, systems had been developed very much with cost-savings in view. The Chief Librarian, M. Briggs, had strong views on information for library management, believing that it was unnecessary to stress the need for accurate and timely information when most decisions in academic institutions are made for political reasons and are little influenced by provision of data.

The fourth library, at the University of Western Ontario (U.W.O.) had actually developed a Management Information System. The design and introduction of this system took place in the early 1970's when the university changed its method of budgeting. Planning at U.W.O. was treated very seriously, with Heads of Department required to submit broad five-year plans, detailed annual estimates of activity and reports on progress in reaching goals. In the early 1970's it was also decided to measure, for the library and other central services, the cost of take-up of service by schools. This placed on the library the burden of providing information not only on how the acquisitions budget was divided, but also on a costing of all library services, so this figure could be divided by Schools. For two years this information was used in budget allocation; however its drawbacks became apparent as Deans attempted to juggle with funds spent on central services, deciding one year to reduce their library expenditure so that they could increase their computing services allocation, or vice versa. This "on/off" approach was obviously undesirable and the method of budget allocation was changed. The library continued to use the MIS it had developed however, and it was still operating, although its usefulness was being questioned.

The disadvantages of the U.W.O. MIS provided an illustration of the problems that have to be faced if libraries decide they need to have a MIS. The U.W.O. experience showed that:-

- Data collection still took place (in spite of there being several automated systems in operation) mainly from manual systems, and was extremely time-consuming.

- The reports from the system took months to produce so they were not in any way timely.

- Compilation of the data, running the programs and producing the reports was very cumbersome and costly in staff time.

- The programs had been designed to produce specific reports. They were insufficiently flexible to produce other analyses which might have been more useful.

- the results of the analysis showed a stable library situation, with little deviation from year to year.

In spite of this the MIS continued at U.W.O., but it was acknowledged by the library that the system as it stood was expensive to operate, insufficiently timely and that the information derived was not particularly useful; serious thought was being given to the system's long-term future.

While neither the WAIT nor U.W.O. situation may hold truths generally applicable, it does seem that some conclusions can be drawn from them. One is that if a library has an extremely pressing need for a Management Information System it will produce one of some kind. It might be a system involving no automation and which operates only after the expenditure of a great deal of labour and time, but if the need is sufficiently pressing a data gathering and distilling process will have to be devised.

However, with this kind of system, which is designed to meet a particular need and which utilises data from a variety of systems not fashioned to interlink, penalties are likely to be paid in terms of efficiency and flexibility.

Once systems have been automated the provision of an MIS becomes more feasible, but again considerable difficulty arises if the concept of the MIS was not present when the separate library systems were designed. Interlinking of data from separate systems, so essential to the efficient performance of an overall library system can become a practical problem, involving expensive re-writing of systems or radical change in manual procedures.

At WAIT, for example, separate development of the Acquisitions and Circulation systems has resulted in there being two unique numbers for each loanable item in the collection, an accession number and a loan number. The numbers are linked to one another in the catalogue system only, and neither number is linked to the item's order number in the Acquisitions system.

While this was quite unimportant when the Library's only concern was that its separate automated systems reduced clerical work by improving the speed and efficiency of procedures, now that the Library has the need to analyse data obtained from its automated systems, and in the course of this to transfer data from one system to another, the methods for doing so are found to be inefficient and complicated.

An alternative solution for the Library, rather than continuing with complicated linking systems, would be a massive retrospective data take-up operation to link each item's loan number with the appropriate order number in the Acquisitions file. This exercise is considered from time to time, but funding has not yet been found for it.

Another interlinking problem is also illustrated by the situation at WAIT Library, where two separate computers are involved. The Acquisitions and Cataloguing systems are operated on the Institute's DEC 10 computer, while the Circulation system uses the Library's own PDP 11/44.

Many libraries which automated one or two of their systems before comprehensive packages such as URICA were available, may consider the price of adaptation to achieve system compatability too great, and it will not be until there is the need for a general upheaval in the library's systems that the opportunity can be taken to introduce a MIS.

INTEGRATED INFORMATION MANAGEMENT: SOME PRACTICAL CONSIDERATIONS

R. S. Walsh,
Technical Librarian,
The South East Queensland Electricity Board,
62-80 Ann Street,
BRISBANE, Queensland, 4000

and

Manager,
Raywal Information Management Consultants,
P.O. Box 176,
NORTH QUAY, Queensland, 4000

Phones: (07) 223 4362 (work)
(07) 208 5120 (home)

ABSTRACT

The problems associated with the organisational politics of an integrated information management system are raised. Many factors have to be considered when information resource centres are being integrated, and the paper addresses some of the practical aspects to be considered under the following headings: design criteria; the analysis of information needs; centralisation versus decentralisation; acquiring, storing and lending material; indexing and retrieval in an integrated system; format compatibility; rules for entering data; vocabulary control; and software availability. A brief introduction to an analytical technique, Structured Requirements Analysis, is given.

INTEGRATED INFORMATION MANAGEMENT: SOME PRACTICAL CONSIDERATIONS

This paper outlines some of the necessary steps to be considered in the development of integrated corporate information management in an organization. It aims to present you with a framework around which you will be able to plan your own integrated information management system. The paper will address some of the problems which can be expected. It does not necessarily attempt to solve these problems for you, because the appropriate solutions depend on varying factors in combinations which are unique to a specific organization. The material in this paper describes a composite of experiences and does not relate to any one organization.

Traditionally, organizations have a number of discrete, self-contained autonomous information resource centres (IRCs), which, since the founding of the organization, have been doing their own thing in their own way. The result of this is that normally there is no compatability between any of the systems used in the IRCs. More importantly, from the point of integrating information services, it means that each resource centre has built up its own clientele and its own sphere of political influence. When the first suggestions about integrated information management are mooted, there will invariably be some strong resistance from the traditional controllers and users of the individual IRCs. They will express concern about a perceived lack of control over the operation of the IRC. There may well be dismay at the thought of the loss of an organizational unit from the control of the traditional supervisor. There will also be the normal fear of change and the expected resistance to that change. This paper makes no attempt to provide answers to those problems. They are highlighted at this stage because one of the most important things that you are going to have to learn is to read and then play the organizational power/politics game. If these basic issues cannot be resolved, there is little chance of success with the subsequent stages.

In the context of this paper, information management is taken to

include all those operations which are necessary to select and acquire, to process and store, to filter and analyze, to record, evaluate and deliver information, wherever it may be physically located in the organization, and regardless of under whose functional control it may be.

The Design Criteria

Start with a very clear picture of exactly what is required. If possible, get these requirements on paper and have them accepted in writing. Carefully identify all the IRCs which are to be included in the management system, and make provision in the later design for the inclusion of any other IRC which might be included at a later time. Be prepared to provide for a wide variety of document types: books, maps, plans, committee minutes, forms, procedure manuals, legislative materials, correspondence, etc. The final system must be flexible enough to allow for the later inclusion of virtually any type of document, or even realia.

Determine who is to have access to what records.

Analysis of Information Needs

Because of the disparate needs expected to be found, it is recommended that the first step in planning the system should be a comprehensive analysis of the organization's information needs. Many techniques are available. The technique I prefer is known as structured requirements analysis (SRA). SRA adopts a "top-down" approach to systems analysis, starting with a set of Prime Objectives, and moving successively downwards through Sub-Objectives, Functions, Function Modifiers, and Activities until the actual Data Elements required to perform those activities and functions and thus satisfy the objectives, are reached. (An example of the SRA is given in the Appendix.)

This analysis serves to identify all those functions, activities and data elements which are similar although having entirely different names. For example, the "drawing number" used to identify plans is analogous to the "author" used to identify books, the recipe

number, the jurisdiction of an industrial award, and the authorising department for a form. Instead of needing five separate fields, all that is needed now, is one field, because the activities and functions performed on the data element "title" are the same regardless of the document type being described. To make the system user-friendly, each separate application is able to continue to use the term with which it is familiar, for example, "book title" for the Technical Library, "drawing title" for the Plan Library, and "jurisdiction" for an industrial award. The system, however, only recognises one field, thus simplifying the programming.

Similar examples were found throughout the data elements for the different types of information.

The SRA also identified similar activities and functions, which, although having different names, served similar purposes. Again, it has been possible to regard these as the same function or activity from a system design point of view, thus simplifying programming.

A further very important side-benefit of the SRA was that by a careful analysis of the results, the supervisors in the different areas were able to see that what each was doing was in fact very similar, and they were happier about the prospects for a successful information management system. What became apparent was that what were originally thought to be irreconcilable differences in activities were in fact only differences in degree.

It is worth stressing that the question of user confidence and user acceptance cannot be given too high a priority or degree of importance. Without an enthusiastic acceptance of the management system's objectives by the staff of the different application groups, there will be very little chance of successful implementation. You can have the best hardware, the best systems design and the best software, and despite that, without the support of people, you will not have a successful system.

The next stage of the needs analysis dealt with the type and extent of indexing required by each user to satisfactorily perform the functions of the resource centre. Indexing and retrieval are dealt with more fully elsewhere in this paper. It will suffice here, to say that while there were many fields to which the same type of indexing could be applied, there were a few fields which required different indexing techniques.

This marked the end of the "macro-analysis" stage where those requirements which would influence the broad philosophy of the system design had been identified. A great deal of analysis still remained to be done on the implementation of the actual functions and activities, but at this point it was known that:

- the data structure would need to provide for a large number of fields
- the fields would need, in most cases if not in all cases, to be variable in length
- to allow for the different input requirements, it would be preferable to look at a "menu-driven" system which would cater for the different inputs but retain a simplified data structure within the processing system
- various levels of indexing were required. There was a unanimous requirement for free-text indexing on nominated fields. There was also a need for a strictly controlled vocabulary. Some users believed that there was also a need for a field which would allow the input of descriptors not found in either the free-text fields or in the controlled vocabulary. Some users wanted to use only one type of indexing, whereas others wanted to use all three, or combinations of the three.
- many of the functions and activities were so similar that it would be possible to cater for their require-

ments with generalised procedures, thus reducing, or simplifying, the programming requirements.

Decentralisation vs centralisation

With the concept of integrated information management it is necessary to decide whether the physical records are to be centralised. It is also necessary that a decision be made concerning the arrangement of the computer files: is there to be one integrated file of all data which is to be handled by the system; or, are the data to be kept in separate files?

The physical location of the records is really of relatively minor importance. Provided that any record which forms a part of the information management system is stored so that its location is known and it can be retrieved as required, the actual decision on the physical location is more likely to involve organisational politics than any logical assessment of needs. Integrated information management allows an organisation to have decentralised records with the benefits of integrated files.

It is recommended that unless there are strong pressures against such a move, the actual records be physically located near to their major users. Such a location should satisfy the normal demand for immediacy of access. It should also reduce the need to develop a document delivery service to users. There is, however, one obvious drawback to a decentralised location. Centralisation provides some scope for effective economies of scale with staffing. In a centralised storage of records, staff have the opportunity to become familiar with a variety of record types and the uses to which they are put. With this degree of familiarity it is possible to interchange staff to meet peak demands in any area. It might also be possible, over time, to reduce the total staff requirements. A decentralised operation does not allow for any of these events to occur.

The "house-keeping" functions

The SRA previously referred to, showed quite clearly that there were three activities which, while having different names, actually performed identical tasks. Furthermore, the SRA showed that these supposedly different activities could be performed using a common procedure which was acceptable to each IRC.

These activities were:

- acquiring material
- storing material
- lending/controlling material

Acquiring material

The SRA pointed to only one major difference between the IRCs in their acquisition of materials. All IRCs, except for the Library, could be described as "passive collectors" inasmuch as these centres only become aware of material when they receive it, whereas the Library normally seeks out material for subsequent acquisition, and could therefore be described as being an "active collector". Intrinsically, there is little practical difference, system-wise, between active and passive collectors. The active collector needs to be able to follow-up the non-receipt of an item from the supplier, whereas, while the passive collector doesn't have that problem with the initial supply, it may have a need to follow-up later editions or productions with its original source of supply. Therefore, on analysis, both groups have the same potential needs. From the design viewpoint means that only one acquisitions module is required to satisfy the needs of all the IRCs.

Storing material

Storage requirements tend to be dictated by the physical form of the materials being used, and the uses to be made of those materials.

The SRA identified only one real interface between the information management system and the storage of the material. That interface was the location code, whether it was a classification number or a sequence number. The system only needs to know where the material is stored, not how it is stored.

Lending/controlling material

The SRA determined that the following types of activities were applicable:

(i) IRCs which lent material (and expected it back!)

(ii) IRCs which did not allow any material to be used outside the centre

(iii) IRCs which provided copies on demand, which did not expect the copies to be returned, and which did not undertake to provide recipients with updates to their copies

(iv) IRCs which provided copies on demand, did not expect the copies to be returned, but which accepted responsibility for providing recipients with updates

No special provisions need to be made for groups (ii) and (iii). Philosophically, there is little to distinguish the activities of groups (i) and (iv). Groups (i) and (iv) both need to know the current disposition of an item, or of any copy of that item, and although they deal with different types of materials, the basic practice for each IRC is identical. Once again, system differences are reduced, and the programming is simplified.

The "indexing/retrieval" function

If there is one point which can be regarded as central to integrated information management, it is the indexing and subsequent retrieval of the information in the system. All other activities are peripheral to these. Three elements combine to effect an efficient indexing and retrieval technique. These are:

- consistency in the format used
- consistency in the form of entry used throughout the system
- consistency in the use of indexing terms

When a corporate integrated information management system is being planned, it is almost inevitable that conflicts in each of these areas will arise between individual IRCs. Each IRC will have been using its own format, its own rules for entry, and its own terminology, and being convinced that its methods are satisfactory will be likely to resist attempts to introduce different methods. Generally, such a situation arises when there is a lack of communication and understanding between the centres. It is essential that the staff of each IRC clearly understand the objectives of integrated information management as it applies to the organisation in which they work. They must also understand the role which their centre is to play as a key element in the integrated information management system. It is, of course, possible for top management to direct each centre to participate but such a course of action should be avoided if possible.

Selecting an acceptable format

The use of an analytical technique such as SSA makes it easy to identify common data elements from each IRC. Once all the required data elements have been identified, it is possible to then look for an appropriate and suitable format. What is needed in the chosen format is consistency and flexibility.

It is at this stage, in discussions with librarians, that the question of the MARC format comes up. Since 1968 a lot has been written about the MARC format and its uses, and yet, there is still a lot of confusion about just how the MARC format fits into the practical everyday work of a library. The simple answer is that it doesn't! The MARC format was never intended to be used as a data processing format. It was designed as a format to facilitate the exchange of data. If you never intend sending data to another library, or receiving data from any other library, you need not concern yourself with the MARC format. If you are involved with data exchange, you change incoming data to your own local processing format, and to send data elsewhere, you change your local processing format to a MARC format.

The above comments imply that there is a relationship between the local processing format and a MARC format. The relationship consists of equating the fields and subfields of one format with the fields and subfields of the other format. This is a relatively simple one-to-one relationship in most cases. (An exception can be the problem which arises if you want to be able to distinguish between the various types of authors, as the MARC format does. Even this problem can be overcome by careful analysis and programming.) Once this broad approach to formats is adopted, it is a simple matter to develop a format which will allow you to provide for types of material not yet covered by a set of MARC specifications, and still be able to exchange data in a MARC format.

From a system design point of view, it is necessary to first decide whether or not, now or at any time in the future, any of the IRCs is likely to need to exchange data with any other unit. If this need does not exist, and is unlikely to ever exist, there is no need to consider the adoption of a format which is MARC-compatible. If a library forms part of the IRCs in an organization it would be foolish to make a decision which will preclude the library from participating in networking and resource-sharing schemes. The SRA has already identified the common fields in use by each IRC and the adoption of a common format should pose very few problems.

Before leaving the consideration of formats, it is worth explaining another of the more common misconceptions about MARC. For some reason, many people believe that the adoption of the MARC format means that they have to change their cataloguing style and include all the elements described in the MARC specifications. This is not so! The published MARC formats are "umbrella" formats which were designed to provide for every possible data field which a library might ever encounter. If you decide to use the MARC format, you select that sub-set of fields/tags which meets your needs. You ignore all the rest!

Rules for entering data

This is an area of greatest potential inconsistency between each IRC. Apart from the librarian and possibly the records manager, it is unlikely that any IRC will be staffed by persons with any professional training in information management. This means that there is unlikely to be adequate controls over the input of data.

System-wise, the designer has two choices:

(i) to decide that each IRC must use the same form of entry, and then to develop and adopt that form of entry; or

(ii) to decide that a consistent form of entry is not necessary, in which case it becomes important to establish some broad rules for the treatment of compound names, initials, inversions, etc.

The alternative finally chosen is heavily dependent on the parent organisation, the staff of each IRC, and the types of information being managed.

The requirement for a consistent form of entry is minimised if the data for each IRC is kept in a separate file. Such a design significantly reduces the value of the information management system and it is doubtful if such a system could be regarded as integrated. Consistent forms of entry assist in cross-file searching, and cross-file searching or total database searching is the ultimate goal of integrated information management. If an overall consistency cannot be achieved, attempt to achieve consistency across those fields which would be common in any cross-file searching, such as the name fields for example.

Probably the best means of achieving consistency lies in the establishment of name authority files for use by all the IRCs. Depending on the available computer resources, the name authority

file could be online and all entries could be checked against it before being accepted. An online name authority file also has the potential to allow quite complex names to be entered by means of a brief code assigned to the names.

Vocabulary control

Vocabulary control is what makes integrated information management successful. Vocabulary control is the single most important unifying and integrating factor in information management. If you are not prepared to implement some form of vocabulary control, then you are wasting your time in looking at integrated information management! A controlled vocabulary ensures consistency in the original indexing of subjects, and results therefore, in consistent retrieval of information by the user. If all the IRCs use the same vocabulary, all the corporate information on the same subject is indexed under the one term. This means that decision makers can quickly obtain a corporate-wide conspectus on a nominated subject. For the first time they have all the wanted information at their finger-tips.

Vocabulary control has as many proponents as opponents amongst librarians. This paper is not the place to engage in a detailed consideration of the pros and cons of vocabulary control, but it is important to understand some of the advantages and disadvantages from each side of the question as to whether or not vocabulary control should be applied. These considerations have important system design implications.

(1) No vocabulary control whatsoever

Logically there are two possibilities available under this heading, and they are not necessarily mutually exclusive. Free-text indexing on nominated fields can be chosen. Alternatively, the indexer can assign terms (not selected from any existing vocabulary) to describe the subject content of the document. If desired, both methods can be used simultaneously as complements to each other.

This particular choice is popular because it is inexpensive. No thesaurus has to be bought, modified, compiled, or maintained. It is quick and easy to use. It can be used by people with an absolute minimum of training.

Abandoning any form of vocabulary control does have a cost -- a cost which I believe to be unacceptably high. The problem associated with not providing some form of vocabulary control is a function of the imprecise nature of the English language: many words have more than one meaning; there are shades of meanings; the same or similar meaning can be assigned to many words; the context in which a word is used colours, and may in fact actually alter the meaning of the same word when used in isolation. In a corporate information system where many people are indexing, and many more are retrieving information, this inexactitude of the language exacerbates the problem of achieving precision in the retrieval of information.

An additional problem of free-text indexing lies in the proclivity of authors to assign titles which sound good, catch the attention, but which do not accurately describe the content of the document. I well remember an article about computerised catalogue card production which was published in the Library Journal under the title:

"PUNCHING THE CATALOG IN ITS CARDIAC REGION"

That the paper dealt with a detailed systems analysis and design for the automated production of catalogue cards is not immediately apparent from the title, and is even less clear if the four keywords PUNCHING, CATALOG, CARDIAC and REGION are taken in isolation. Yet, in a free-text system, without abstracts, that is all the subject indexing that would be provided.

The inclusion of abstracts obviates that problem to some extent, but it is only a partial solution, and what is its cost? How do the costs of preparing, inputting and storing abstracts compare with the costs of developing, using and maintaining a thesaurus? I don't know, but my guess would be that in the long term there would not be much difference, and you still have to cope with the imprecision of the English language.

(ii) Vocabulary control

A controlled vocabulary assumes the existence of a list of words or phrases. This can be nothing more than a simple list of words arranged either by subject or alphabetically. It can be a structured hierarchical thesaurus showing BROADER, NARROWER, and RELATED terms, and giving SCOPE NOTES and SYNONYMS. What matters is not the style of the list, but that there is a standard, a point of reference which is used to guide both the indexer and the searcher. The more comprehensive the list, the more precise the retrieval is likely to be. The type of list chosen will depend on the subject coverage required; the degree of subject specificity needed; the amount of information to be indexed; and the types of people using the system.

If you opt for vocabulary control, and if you are very lucky, you will find an existing thesaurus (or thesauri) which will meet your requirements. If you cannot find a suitable existing thesaurus (or combination of thesauri) you have two choices: (i) develop your own thesaurus; or (ii) abandon ideas of vocabulary control. There are so many thesauri available today that most libraries should be able to find acceptable existing thesauri.

Speaking from personal experience, I can assure you that developing your own thesaurus is not a task to be undertaken lightly. It requires an enormous commitment of time

and a significant commitment of computing resources.

If you are still committed to the concept of vocabulary control there are a number of other issues which you can address as an aid in selecting one or more alternatives:

(a) Online thesaurus versus printed thesaurus

A printed thesaurus is used in exactly the same way that an existing thesaurus such as the LCSH is used. It requires that each use of each term be entered separately, thus opening the possibility for transcription or spelling errors, either of which will "lose" material during a subsequent search, because the computer will regard each mis-spelt term as a different term.

With an online thesaurus it is possible to automatically assign a term to a document by associating a document number with a code assigned to the relevant subject term. The input of a numeric code has been shown to be faster and more accurate than inputting a term. An online thesaurus can also be arranged so that synonyms are automatically switched to the preferred term, thus making the system more user-friendly by allowing users to retain and use their normal terminology.

Search routines in conjunction with an online thesaurus can provide for the optional searching of broader or narrower terms in the hierarchy.

(b) Use of thesaurus terms PLUS free-text indexing

This alternative should be self-explanatory.

(c) Use of thesaurus terms PLUS free-text indexing PLUS index terms which are not part of the controlled vocabulary

The imprecise nature of the English language has

already been mentioned, as has the tendency of authors to use catchy titles. Unfortunately, the combination of terms from a thesaurus and terms from free-text indexing will not always achieve the desired degree of precision. Sometimes the term which will really describe the item just isn't there.

The inclusion of a third level of indexing can give the indexer total control of the indexing terminology. This third level allows the indexer to include terms which supplement any other terms.

Indexers and searchers have the choice of using any of these three modes, all three of them, or any combination of the three.

Updating and access modes

Basically, there are three updating or access modes available. These are: (i) offline or batch mode; (ii) online; or (iii) interactive or conversational online mode. Some systems allow the user to optionally choose the mode. Normally, the modes are independent. For example, the choice of a batch mode for updating does not necessarily mean that the batch mode must be used for all other activities. It is possible to have interactive data entry with batch updating. In determining the mode to be chosen for various activities, consider the following points:

- what delay in processing is acceptable?
- what response time is acceptable?
- can a batch system satisfy these requirements?
- if an online mode is selected, does it really need to be an interactive mode?
- who can access the files for "read only" activities?
- who can input data?
- what access security is provided?

- what data security and system back-up is available?
- what happens when the system is down?
- can the costs of the selected mode be justified?
- after all these considerations, is there still a better way to do it?

These are just a few of the matters to be considered when designing any information system. They assume even greater importance when the system is to manage the corporate information.

Where do I find the system I want?

Chances are that the system you'd like isn't available. Therefore, you are faced with yet another choice. You can arrange to have your own system written to your own specifications, or you can compromise, and select a system which meets most of your requirements.

Writing and testing programmes for your own set of specifications is expensive, and unless you know in advance exactly what you want, and know how to specify it, and can supervise the programmers, you are unlikely to get what you've specified. Software houses are adept at interpreting specifications to their advantage, and unfortunately, what is to their advantage is very often to the customers disadvantage. If you insist on doing it your way, employ an experienced systems librarian as a consultant. It will save money in the long term. The cost of writing your own software for all the functions described in this paper would be likely to be in excess of $100,000.

Suitable software does exist and the range is increasing rapidly. There has been a tremendous growth in the availability of library packages capable of being run on microcomputers. Current technology provides micros which will cope with the requirements of libraries with stocks numbering around 100,000 catalogued items so computing is well within the reach of most libraries. Software packages vary in their degree of sophistication. Packages ranging in price from $400 to $160,000+ are available. Only a detailed analysis of a package will

determine if it is the right package for you. It is an exercise well worth undertaking.

The following select list of references will assist in determining the availability of software packages:

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3. DE FERRANTI, Barry. DP index, 4th edition. Prahan, Vic., Peter Isaacson, 1982
4. INTERNATIONAL directory of software. London, Computing Publications, 1982
5. MICRO software report, library edition. Torrance, CA., Nolan Information Management Services, 1983
6. MICRO software evaluations. Torrance, CA., Nolan Information Management Services, 1983

Conclusion

Integrated information management is a new application of some old techniques. The technology to accomplish it exists. The expertise to accomplish it exists. Whether individuals have the flexibility of attitude which will permit them to take a fresh approach to this matter remains to be seen. Many librarians shy away from becoming involved with anything which doesn't come within the so-called "traditional" library framework. We are living in a world which is much more information conscious than it was a few years ago. There is a growing demand that information be better managed and more readily available. If librarians cannot or will not prove that they are capable of providing the degree of management being demanded, others will, and librarians will find themselves left out in the cold — probably with some justification!

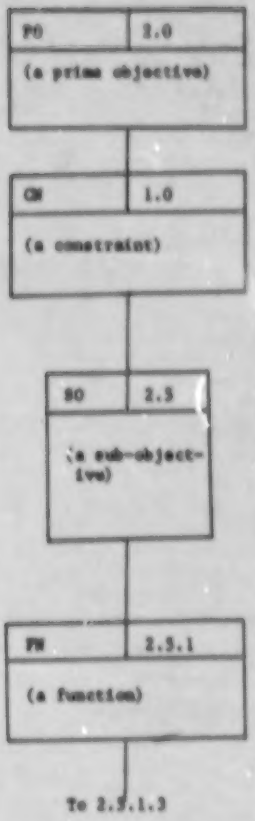
STRUCTURED REQUIREMENTS ANALYSIS

Structured Requirements Analysis is an analytical technique developed by staff of The South East Queensland Electricity Board as a means of providing people with little or no training and experience in systems analysis and design with a powerful tool to assist them in defining their system requirements.[1] SRA is a top-down approach to an organisation, or sub-elements within that organisation. By adopting the top-down approach, the analysis is constantly related back to the objectives of the organisation under study.

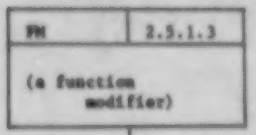
The stages in producing a Structured Requirements Analysis Report:

1. Establish the PRIME OBJECTIVES of the organisation being analysed.
2. List all the CONSTRAINTS which impinge on the environment in which those PRIME OBJECTIVES have to be achieved.
3. Establish all appropriate SUB-OBJECTIVES to the PRIME OBJECTIVES, taking into account the effects of the identified CONSTRAINTS. SUB-OBJECTIVES must cover all the essential areas encompassed by the PRIME OBJECTIVES. There may be multiple levels of SUB-OBJECTIVES.
4. Determine those FUNCTIONS which are necessary for the achievement of one or more of the OBJECTIVES or CONSTRAINTS. A FUNCTION is a class of processes involved in the transformation or handling of inputs or outputs. A FUNCTION must include one or more ACTIVITIES.
5. Examine those FUNCTIONS and determine if any suitable alternative means of achieving the same result exists. These, if they exist, may be listed as FUNCTION MODIFIERS. FUNCTION MODIFIERS are best regarded as a re-statement of an objective. They provide an opportunity to re-think the direction of the analysis without going right back to the start -- provided always that the PRIME OBJECTIVES remain valid.
6. List all the ACTIVITIES which have to be completed to complete each FUNCTION.
7. List all the DATA ELEMENTS essential to each ACTIVITY.
8. Draw the SRA schematic.

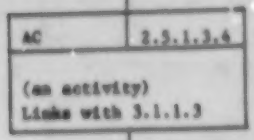
The schematics on the next pages trace the development of ONE activity. In a complete schematic, one page of diagrams is usually devoted to each of the items defined above (1-6) with extensive cross-referencing being provided.



NOTE: There would be many more prime objectives, constraints, sub-objectives, functions, function modifiers, and activities running parallel to the examples shown here. For example, the numbering used shows that this is the 2nd prime objective, the 5th sub-objective associated with the 2nd prime objective, and the 1st function associated with the 5th sub-objective. The direction at the bottom refers us to the 3rd function modifier associated with the 1st function in this particular hierarchy. Other hierarchies will have a similar development.



To purchase monographic materials.



To place orders with the selected vendors.

Data elements: purchase requisition no.; purchase order no.; author(s); title; publisher; price (estimated); date ordered; requester; no. of copies; vendor name; vendor address; budget allocation code.
Documents required/produced: purchase requisition forms; official order forms

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To put this into perspective, the other activities associated with FN 2.5.1.3 are: (i) to select monographs; (ii) to bibliographically check and catalogue check the selections; (iii) to select vendors with whom the orders will be placed; (iv) to review the material which is on order and to expedite/cancel as appropriate; (v) to accession material when it is received; (vi) to record statistical and budgetary data for material on order.
All common data elements become quite obvious as do any similarities in processes when the schemata are reviewed. The note in AC 2.5.1.3.4 "Links with 3.1.1.3" indicates that 2.5.1.3.4 and 3.1.1.3 have an interface.

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ONLINE INFORMATION RETRIEVAL:
SOME PRACTICAL EXPERIENCES

ANN D. WILSON
ROSEMARY H. COTTER
COLLEEN G. SKINNER

RMIT CENTRAL LIBRARY
LEVEL 5, BUILDING 10
376-392 SWANSTON STREET
MELBOURNE 3000
Phone: 341 2065 (business) 419 5807 (private)

Special interest group: online searchers

Abstract: Three short papers covering (1) a general overview of the online search service at RMIT, (2) online searching for applied science and engineering staff and students at RMIT, (3) document delivery, particularly interlibrary loans at RMIT. The papers aim to present practical information.

ONLINE INFORMATION RETRIEVAL: SOME PRACTICAL EXPERIENCES

PAPER 1: GENERAL OVERVIEW (Ann Wilson)

Organisation of reference work at RMIT

In both the Central Library and Technical College Library at RMIT, the responsibility for reference work for each department and subject area is allocated to specific reference librarians. There are thirteen subject reference librarians in the two colleges, and their duties include reader education, collection development, liaison with the staff and students of their departments, as well as all aspects of reference work. Online searching is part of the normal duties of subject reference librarians, and is another method to be considered when dealing with reference enquiries. Reference librarians usually do searches for the staff and students of their own departments, but may assist in other areas as required, for example when a colleague is on leave.

Selection of searchers

We are engaged in passive selection of searchers, that is all subject reference librarians have been trained, over a period of time, to do online searching. This has avoided the creation of an elite group, and any sense that online searching is a mysterious, sacred rite. As online searching is seen as a logical extension of reference work, it has been incorporated into the normal working pattern. The training of all reference librarians, rather than just a small group, is recommended for producing a team spirit, and a sharing of knowledge and information. The increasing diversity of databases means that no one person, or even a small group of people, can be fully competent in all areas. While some of the problems of different command languages for systems may be solved by the use of microprocessors as search terminals, the databases will still be produced by independent producers, and will have their own idiosyncracies for some time to come.

It is likely that allowing all reference librarians to do their own searching is a more expensive way of operating the service. While some librarians do several searches per week, others may only search once or

twice a month, and the lack of practice may mean slower searches. We have met this possible additional cost in order to ensure that we have the subject knowledge available to our customers. It is also good for the morale of reference librarians to be involved in a new and important part of reference work.

Customers

Our customers are RMIT staff and final year, graduate and post-graduate students. As well as online retrospective searches, we offer SDI services. We prefer to have the requester present when we do a search. He or she can usually provide additional subject knowledge, and can take full advantage of the interactive nature of online searching by assisting in refining the search strategy when initial results are reviewed.

Services available

RMIT had some early experience with AUSINET, but DIALOG, with its wide range of databases relevant to RMIT, was the first system of which we made major use. We started using AUSINET again as soon as the pricing structure became based on use, and we have joined other services to gain access to exclusive databases. We are currently using DIALOG, AUSINET, ESA, ORBIT, Infoline and Australian MEDLINE.

Any library has problems, at present, using a number of systems. The different command languages mean searchers have to be trained for and remember more than one system. At RMIT, all searchers have been trained on DIALOG, and most can use at least two systems. With the less-used systems, one or two searchers have become our local experts, and will assist other searchers. We do aim to give requesters access to the systems and databases needed to complete their enquiries, so we try not to be put off by the fact that we may be ORBIT experts but Infoline novices, and seek assistance from our fellow searchers.

Co-ordination

The Senior Reference Librarian acts as the coordinator of the whole service, but each system is allocated to an individual searcher. We have

established an Information Services Co-ordinators Committee at which information about systems and databases is exchanged, and policy is discussed and proposed. The system co-ordinators report on changes and developments in the systems. The minutes of this committee are circulated to other searchers, but there is a standing invitation to any searcher to attend the meeting. The committee aims to meet monthly, and although pressure of work does disrupt the schedule, this forum of discussion and exchange of ideas has been found to be very useful in a library system with several searchers who are not all located in the same office or even in the same building.

Training

As far as possible, we have tried to get our training from the systems and database experts, taking advantage of any free training sessions, but paying for it when necessary. It is important to have funds available both for training and re-training. Even extensive searching experience and conscientious reading of manuals and newsletters is no substitute for training and refresher sessions with systems and database personnel. Records are kept of who has attended what course. It is important to realise that this is a continuing cost in an online search service, something which may not always be appreciated by the people in charge of the budget.

We have not yet developed any self-training sessions but may have to if system and database training becomes too expensive. This method is less-favoured because it adds an extra responsibility to the trained searcher who usually has enough to do in remembering how to use the system and trying to do effective searches.

Funding

The online searching service has been centrally funded to date, as an item in the library budget. This has resulted in a very free atmosphere for searchers. We have not been constrained by the financial position of the requester to limit the search to the shortest time and the fewest and cheapest databases. The budget has also been sufficient to cover practice

and the inevitable errors - though they would have to paid for by the library anyway, and not the unfortunate requester!

We are now considering a charging policy in case central funding stops. We have to admit that the searchers are not happy about this as it seems to go against the principle of free library service, and may disadvantage the students more that the staff who may be able to get departmental and research funds. It will also mean more work in the preparation of accounts and collection of fees. And there will be pressure from the requesters to limit the charges which may mean less comprehensive searches. Charges may be inevitable for us, but they are regrettable.

Stationery, records and statistics

We have designed several forms, keeping each as simple as possible.

1. Search request form (Attachment 1)

   This form is usually filled in by the requester, and ends up as the searcher's record of the search. The form may be filled in after an interview with the requester.

2. Online information searching explanatory handout

   This was designed mainly for student requesters to assist them to do some of the search preparation as an educational exercise. If they work through it they get a practical demonstration of the use of printed sources, and they can be more active participants in the on-line search. It may also be given to staff requesters to help them add to their lists of search terms. In either case, the searcher, of course, will also spend time preparing the search strategy.

3. log sheet (Attachment 2)

   We define a search as a topic, and search as many databases as necessary to answer the request. The log sheet records details of the requester, brief search title, and systems and databases searched. The log sheets are used for the chore of invoice checking, which is a time-consuming task if there is a heavy load of searching. The log sheets are also used to produce some analysis of the service. From

them we can record the number of searches and the number of users of the service, both broken down by staff and students. They also provide a handy overview of search topics.

It is important to design a log sheet which is easy to fill in and which collects all the data required. The one we use currently is our third version.

4. Copyright warning

We started attaching this to all offline prints after we had a near-miss with copyright - one of the requesters made multiple copies of his search results to be included as an appendix to a publication!

5. Analyses sheets

Using the invoices and the log sheets, we analyse the costs of searching the systems, total costs, and use of the service.

6. SDI profile record form (Attachment 3)

These are filed by profile number for invoice checking, but a copy could be made to provide a listing by requester.

Distribution of offline prints

We note the date of arrival on the log sheet - this can be useful if we want to report delivery problems to the system. We also make a copy of the search strategy summary, if there is one, for the searcher's files. The copyright warning notice is attached before the prints go to the requester.

Publicity

We have published a pamphlet briefly outlining the service, produced a display, organised demonstrations for groups of staff, and included on-line demonstrations in most reader education sessions for senior students.

We have not blanketed the campus with publicity because we could not cope with many more requests than we already get. With this limited amount of publicity, we have had a substantial increase in student requests for searches, and a steady flow of requests from staff.

Evaluation

We have not undertaken any systematic evaluation of the service to date, and have relied on feedback to individual searchers. The feedback we have received so far has indicated a general level of satisfaction among our customers which we hope would be confirmed by a formal system of evaluation.

Basic statistics

The table below indicates the growth in the use of the service since we began full-scale searching in 1980.

INFORMATION SERVICES	1980	1981	1982	1983 to June
No. of searches (i.e. topics)	291	399	513	396
No. of student users	30	108	214	225
No. of staff users	122	153	153	102
Total no. of users	152	261	367	327
DIALOG/ESA/ORBIT hours	112	166	204	146
AUSINET hours	11	37	60	22
Total hours	123	203	264	168

PAPER 2: ONLINE SEARCHING IN SCIENCE AND ENGINEERING (Rosemary Cotter)

Use of online search facilities by staff and students

Academic staff may request online searches in order to develop courses, to update information on a specific topic, for research, and as a result of consultancy work undertaken by them as individuals or through Technisearch Limited. Consultancy work may be undertaken for private companies or government departments. Other staff may simply request information which we obtain through online searches.

The majority of searches for undergraduate students are for final year projects, many of these being of a research nature or at the forefront of existing knowledge. The main objective of our reader education programme is to encourage the development of information retrieval skills in the short term (studies at RMIT) and the long term (future employment). We believe that it is important for students to develop these skills and to be aware of the recent technical developments which may not be available in their place of employment. They may not even have access to a library. We run sessions outlining the existing database systems, and use examples of search requests as case studies in preparing for an online search. A demonstration of online searching on different databases is included in these sessions. We do expect students to have done some preparation before we carry out an online search: they should provide a list of keywords (usually obtained by consulting the appropriate abstract or index) and any known relevant references.

We occasionally carry out online searches for earlier year students in cases where very little has been published, or where new terminology makes it extremely difficult to search through printed publications.

Another important category of user is the masters student. There are approximately 80 students enrolled for masters degrees by research in the Faculties of Applied Science and Engineering. All of these students have to attend sessions in the library as part of their Research Methods subject. These are fairly intensive sessions which include all aspects of information retrieval including online searching.

Details of the various categories of user in the Advanced College of RMIT are given in Table 1; the numbers of searches carried out for the

Faculties of Applied Science and Engineering are given in Table 2.

Types of searches requested

Requesters seek current information in the form of a Citation Index search, an SDI profile or retrospective bibliographical information, the latter being the most common. We will also check citations if our printed indexes/abstracts are not adequate in a given subject area. As far as possible we avoid patent-only searches, preferring to refer users to the Patents Sub-Office. Requests come from single users as well as self-organised groups of students working on different aspects of the same topic. We encourage users to sit in on the search for two reasons: firstly for their subject knowledge, and secondly so that they become aware of the procedures and individual databases. One of the most common problems is terminology: different database producers may prefer different terms in indexing the same document, and a user may "prefer" another term altogether. A background in searching the printed indexes and abstracts usually proves advantageous. Obviously with experience we can anticipate some problem areas before going online; however, completely straightforward searches often create a false impression that all online searches are plain sailing. Some clarification of word usage or unexpected nil results generate a better understanding of the organisation and capabilities of the systems. Perhaps, as in other spheres, we learn best through mistakes rather than through being always right. Occasionally in areas of broad interest, or lesser known subject areas, we carry out a preliminary search, assess a few references offline, refine the search, and then carry out a full search.

Time is always a critical factor and although some students would like an 'instant' search, after explanation most students appreciate that some preparation is usually advantageous. In addition we have to arrange a mutually convenient time for the searching. We sometimes do searches for part-time students without the requester being there, as it is sometimes impossible to find a mutually convenient time.

Usually we sample some of the retrieved references, using the title only or title and indexing term formats to ensure that we are retrieving what is required. As a general rule we will print only a limited number of references online, and request other prints offline.

Users sometimes request references which contain specifically Australian or Asian data. Such material is frequently non-existent in some areas. Even when it is known that there is unlikely to be much, if anything, published, establishing conclusively that this is so is not always easy.

Range of systems and databases accessed

As can be seen from the departmental names in the two Faculties, we need to access a wide range of databases. The most frequently used systems are DIALOG, Australian Medline, AUSINET, with other systems being used for unique databases, for example: ORBIT for SAE, SPORT; ESA-IRS for IRRD, Acompline; INFOLINE for PIRA Abstracts, ZLC, RAPRA, Chemical Engineering Abstracts, EPA, Geomechanical Abstracts. The individual down times of the various systems may influence the system chosen for any particular search.

The three subject reference librarians in the science and engineering areas have responsibility for specific departments but in most cases are able to substitute for each other during leave periods and to cover rostered evening duties.

Table 3 gives an analysis of the most frequently used science and engineering databases.

Attitudes and expectations of users

These vary from those who are grateful for a search within a few weeks and provide a list of key terms, to those expecting data to pour out on tap at the flip of a switch, to those who ask "where do we go to do a search?". We should not delude ourselves that we will always do all the online searching. In the final year and masters reader education sessions we do mention the use of personal home computers and such developments as the Knowledge Index (DIALOG) and the After Dark (BRS) services which are shortly to be introduced into Australia. After close observation of our performance in the initial search, users entrust us with future searches (if they are unable to be present), and treat the online capabilities as just another facet of the reference service.

The most common misconception is that a search will be international in coverage and absolutely comprehensive, i.e. all the documents in the world on X. We then have to explain the limitations due to the types of source material included, the bias of individual database suppliers, language barriers, etc. More often that not we search more than one database for each search. Extensive reader education has raised the expectation of the users and they are more critical of the types of data available to them. Our sources of information frequently cover non-library sources too.

To the users, all items appear to be equally obtainable, simply because a single list of references has been printed. Having increased their awareness and raised their expectations, we need to provide adequate document back up, or else curtail these services. This aspect will be covered in detail in the next paper.

Most of the final year students are very responsive to requests for more information at the initial stages of the search. They also respond well in reporting back on the comparative value of the various databases used for a single search, and the source of the most useful documents and references. This is useful feedback for our ongoing work as reference librarians. It is rewarding to see their excitement at whole new vistas being opened up, although occasionally dismay is expressed at the volume of references retrieved. Nevertheless users usually prefer to sift through a selection of references and use the most relevant items. Where students from the same class either select or are set individual projects, there may be some resentment over the uneveness in the amount of published literature existing for the various projects: they expect there to be an equal amount of data for each topic. As a result some students keep on requesting more searches in other databases in the hope that something will turn up. There is a small number of users who think it is an immediate labour-saving device which will remove any need for effort on their part. They soon learn otherwise!

An unexpected aspect which is sometimes encountered is the misunderstanding of the search logic. Given that the majority of students in these two Faculties would have some appreciation of Boolean logic, the additional terms suggested for inclusion in the search are often surprising.

Relationship of online searching to other reference work

I believe usage of the online facilities has improved our knowledge of the printed equivalents, especially with respect to the indexing terms for individual databases. We have over 100 titles of printed abstracts/indexes in the Reference Collection, some 40 of those being in the areas of science and engineering. Being a large institution, we can maintain a wide range of search aids and thesauri which provide an excellent and necessary back up to the services. In short, we regard the use of online information retrieval as an integral part of our reference services.

Table 1

Data on departments within the Faculties of Applied Science and Engineering in the Advanced College sector of RMIT, 1983

	No. EFTS*	No. of final year students	No. of post-graduate research students	No. of academic staff	Teacher Education	Final year comm.
Faculty of Applied Science						
Applied Biology	913.9	334	25	39	✓	-
Applied Chemistry	388	92	16	32	✓	✓
Applied Physics	396.8	97	14	31	✓	✓
Computing	396.3	98	1	19	✓	varies
Mathematics	231.8	57	-	26	-	-
Surveying	264	79	2	21	-	-
Total Nos:	1980	637	46	161		
Faculty of Engineering						
Applied Geology	115.5	21	2	8	✓	✓
Chemical Engineering	152.3	19	5	9	✓	-
Civil & Aeronautical Engineering	375	68	2	19	✓	✓
Communications & Electronics Engineering	487	112	8	29	✓	✓
Electrical Engineering	192	30	3	12	✓	✓
Mechanical & Production Engineering	250	35	1	22	✓	✓
Metallurgy & Mining	124.5	15	1	11	✓	✓
Total Nos:	1694.5	298	24	110		
Overall totals	3683.5	935	72	271		

*Excluding Emily McPherson and External Studies numbers

Table 2

Number of searches by year

	1981	1982	1983 Jan-June
Faculty of Applied Science	96	112	118
Faculty of Engineering	102	133	120
Total number of searches:	198	245	238

Table 3

List of frequently used databases in the areas of science and engineering: 1981 - June 1983

Databases	Time in hours
COMPENDEX	53.69
INSPEC	49.55
CA SEARCH (5 associated files)	38.98
MEDLINE	29.99
NTIS	24.84
METADEX	24.57
BIOSIS PREVIEWS	20.17
Food Science & Technology Abstracts	7.84
Scisearch	7.16
Georef	5.98
CAB Abstracts	5.38
Excerpta Medica	5.13
Agricola	4.50
World Aluminium Abstracts	2.26
BHRA Fluid Engineering	2.07
Geoarchive	2.06
Weldasearch	2.04
IRRD	1.20
Nonferrous Metals Abstracts	1.09

PAPER 9: THE INTERLIBRARY LOANS SYSTEM AT RMIT (Colleen Skinner)

The effects of online information retrieval on interlibrary loans

Information retrieval at RMIT has benefitted greatly from the introduction of online searching. Subject searches that would have taken professional librarians hours of painstaking work are now achieved in a fraction of the time. Online searching has provided access to a much wider range of international information resources than were available to us previously.

However, the ultimate benefit to the user of online searching is still dependent on the success of the supporting document delivery system. If we do not hold the required document at RMIT, this usually necessitates an interlibrary loan. Therefore, online searching has meant an increased demand for interlibrary loan requests. Annual statistics since the introduction of online searching show a substantial increase in the number of interlibrary loan requests during a period of low growth in student/staff population. (see figures 1 and 2)

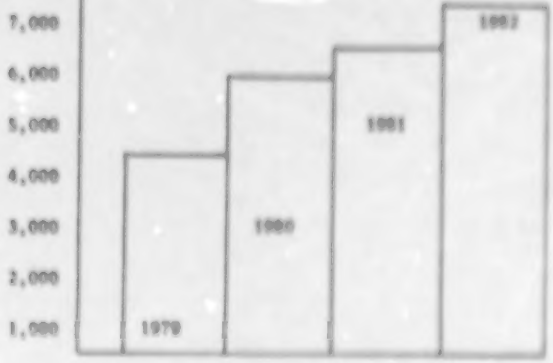

Figure 1: no. of I.L.L. requests 1979-1982

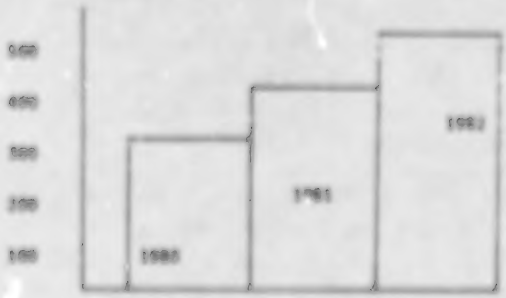

Figure 2: No. of online searches 1980-1982

One aspect of a 1982 BNIT staff user survey was the source of reference of interlibrary loan requests. During June and July, staff were sent a questionnaire with each document received for them on interlibrary loan. Seven hundred and four questionnaires were returned, a response rate of 17.4%. Articles and books accounted for 47.8% of the references, and online searches for 21.2%. Although this was not as high as expected, it makes an interesting comparison with a 1981/82 British Lending Library survey of the sources of reference used by their customers.[3] Online searches accounted for only 6% of references for academic library respondents.

The scope of the survey was limited, and therefore to gauge more accurately the effect of online searching on interlibrary loan traffic, all interlibrary requests for the year would need to be monitored, because students now account for more online searches than staff members.

The number of interlibrary loan requests received up to September this year, giving online searches as a source of reference is 339.

Linked to increased demand for interlibrary loan requests is an increased demand for 'grey literature', i.e. material which is difficult to trace and obtain such as conference/symposium proceedings, theses, technical reports, translations etc. There have been substantial improvements in the bibliographic control of 'grey literature' over the last two decades, in

coverage and speed of access. This has lead to a greater demand for these types of publications but supply has lagged far behind bibliographic access.

At RMIT, analysis of a sample of 10% of 1981 interlibrary loan requests, showed that although only 13.6% of requests were for conferences, theses and technical reports, the likelihood of being able to obtain these types of requests was much lower than for journal articles or books. One-third of requests for 'grey literature' was unsuccessful compared with 14.3% for books and 5.3% for journal articles. Of course, this doesn't mean that these unsatisfied requests were all unobtainable through interlibrary channels. If users had wanted us to pursue these requests further, more of them may have eventually been obtained. However, it does illustrate the difficulty in locating and obtaining these types of material. The number of requests for 'grey literature' up to September 1983 is 600.

A further effect of increased demand for 'grey literature' is the increased staff time involved in verification and location of requests. Although online searches provide computer printouts of references, the common practice of abbreviating words in the citation can make it difficult to decipher them, and a printed source is usually required to be able to provide the full citation for publications other than books or journals.

A less obvious but important effect that online information retrieval has had on the interlibrary loan system, is to increase users' expectations of the service. After using an information services system which provides access to information resources at the touch of a keyboard, users are then confronted with a traditional paper-based interlibrary loan system from which to obtain their documents. There is a 'technology gap' between the two systems which many users are not aware of, and because of this 'gap' users' expectations of the interlibrary loans system are not always met.

Evaluation of the interlibrary loan service

Two surveys relating to the effectiveness of the service have been run over the past couple of years:

1. Analysis of a sample of 1060 completed requests for the year 1981, both filled and unfilled, was mainly designed to check the satisfaction rate and delivery time provided by the service.

2. A 1982 user-satisfaction survey, designed primarily as a librarianship student project. Although some useful data was gained from the survey, it did have some serious limitations:

- Only staff users were surveyed, although students now account for more online searches than staff.
- Only satisfied requests were included, and obviously users whose requests are filled are more likely to be satisfied with the service, than those whose requests are not filled.
- Only items received during June and July were surveyed, which means the original requests would have been submitted before the busiest times of the year, when our turn-around times would have been shorter. Therefore although user satisfaction appeared to be high, it would be unwise to assume that the service is successfully meeting all users' needs from these results.

Apart from these surveys, evaluation of the performance of the inter-library loan system relies on the statistics kept of daily operations: the number of new requests, total requests (i.e. includes re-requests), and items received. The satisfaction rate has fluctuated over the years as the following table shows:

Annual I.L.L. statistics 1978 - 1982

	1978	1979	1980	1981	1982
New requests	4132	3985	5036	6121	6855
Total requests	N/A	N/A	N/A	8200	8641
Items received	3427	3637	4659	4889	6023
% filled	82.9	91.3	93	79.9	88.1

The interlibrary loans service has reached a stage where it cannot cope with increased demands made on it, unless further resources are put into the system.

We should be considering alternative systems, such as online ordering of documents from individual databases, which have been available for some time. Although this is a service we have rarely used to date, in some cases it is a viable alternative to interlibrary loan, especially for material which is difficult to obtain such as conference proceedings, technical reports, etc. For certain categories of material which cannot be located in the usual union lists and that are needed in a hurry, it would be worthwhile ordering online. Even though the costs and deposit accounts initially put us off using this service, the savings in staff time could eventually make it cost effective. Another possibility is asking users to pay a fee if they require a 'rush service' utilizing online ordering.

Further developments in the technology of online information retrieval have made full-text transmission of documents possible. A number of journals, such as Harvard Business Review, are now simultaneously published electronically, and in hard copy, and are available online in full text. In 1979, the Commission of European Communities commissioned a study on document digitalisation and teletransmission.[2] The study confirmed that it was technically possible to convert a document into a digital form which can then be stored in a computer database and transmitted by digital telecommunications to printers located near the user. A system called ARTEMIS was conceived which would provide, through a network of computers and communication links, a conduit via which an information provider can deliver on demand the full text of a document to an information user.

To interlibrary loan staff, the possibilities of the new technology may seem remote, but with the proposed launching of Australia's domestic communication satellite (AUSSAT) in 1986, a whole new era of document delivery is dawning. However, I imagine there will still be users wanting us to get them a photocopy of an article from Melbourne University or C.S.I.R.O. for a long time yet.

The way we send these interlibrary loan requests to other libraries may change. Electronic mail services such as ACIMAIL are already operating and may be cheaper than telex, which we use at present for urgent requests held interstate.

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RMIT LIBRARIES

AW21

REQUEST FOR LITERATURE SEARCH

Staff search		Student search	
RMIT research	☐	Undergraduate (final)	☐
Res reserve	☐	Undergraduate (other)	☐
Reading list	☐	Graduate	☐
Library	☐	Higher degree	☐
Other _____			

Databases	Other sources
Date of search	

REQUESTER

DEPARTMENT

PHONE NUMBER

Date of request

Australian material only

English language only

Foreign language (please specify)

_____

Period to be searched _____

_____

SUBJECT: Please give as full a description as possible.
Refer to related sheet RMIT Libraries Online Information Searching.

Fig. 3 Request for Literature Search form.

RMIT LIBRARIES ONLINE SEARCH RECORD

Australian time Australian date MIDAS user name System date	Staff Search ☐ RMIT research ☐ New course ☐ Reading list ☐ Library ☐	Student Search ☐ Undergraduate (final) ☐ Undergraduate (other) ☐ Graduate ☐ Higher degree ☐	Requester Dept. Searcher Other search

SEARCH TITLE

Log on: system time	Log off: system time	System	Database	Prints online	Prints offline	Comments / Date printout received
						Bill(s) checked

81

RZ/83

Fig. 4 Online search record log

AR22

Fig. 5 SDI Profile record form

RMIT CENTRAL LIBRARY REFERENCE SECTION

SDI PROFILE RECORD FORM

Profile no.	Data bases	Date established
System	Ref. Librarian	Date cancelled

Name

Department

Phone no.

Staff/Student

Profile (photocopy of input acceptable)

A LIBRARY NETWORK OR A COMPUTER NETWORK?

MODELS FOR LIBRARY CO-OPERATION USING ON-LINE COMPUTER SYSTEMS BASED ON DATABASE TECHNOLOGY

F. J. Austin
Systems Librarian
AMA Computer Services Pty. Ltd.,
246 Glen Osmond Road,
Fullarton,
South Australia. 5063

Telephone: (08) 79 9881 (work)
(08) 248 3339 (private)

Special interest: Library networks; Database systems.

ABSTRACT

This paper is written primarily for small to medium size libraries (whether they be public, school, TAFE, or special libraries) looking at ways of automating their systems and at ways of developing library co-operation in a region. It presents guidelines and discusses alternatives for the realisation of a regional network based on a fully-integrated library system using a mini-computer, either jointly owned or run by a bureau. Much of what is discussed in this paper applies equally to libraries of any size that may be contemplating sharing an automated system.

1 Introduction

Library automation is not an insignificant subject in matters of both cost and intellectual planning effort on the part of any library, whether large or small. This paper addresses some real possibilities in the arena of co-operative endeavour. Automated library systems can greatly assist efforts towards developing library co-operation. Sharing machine-readable data and even sharing computer hardware can be achieved with the computer systems that are available today.

The chief purpose of this paper is to provide some assistance to those small to medium size libraries planning to automate in the near future. The anticipated size of these libraries is a stock of 20,000 to 50,000 titles. Libraries of this size are typically too big for a micro-computer system and frequently too small to justify the acquisition of a mini-computer system exclusively for the library.

2 Database Systems

Developments in library automation have been greatly assisted through the use of database management systems. The use of database management packages for library applications was addressed in a paper by C D Jivelsky for the first VALA conference (1). In her deliberations Jivelsky favoured the relational database model as the one most suited to library applications. An outstanding example of a relational database management system is the AMA REALITY/SEQUEL mini-computer - a fact acknowledged by the computer industry and by existing users (2). The standard operating system for this computer supports the use of a relational database and a powerful retrieval language called ENGLISH.

Three main features of the REALITY/SEQUEL relational database which are of great significance to libraries are:

- Variable data content;
- Variable data length;
- Lack of redundancy.

2.1 Variable data content

Only the information relating to a particular record needs to be stored for that record. For example, if a title has no author, no space is wasted in making allowance for that non-existent author. Similarly, if a borrower has no items on loan, no space is used in making allowance for non-existent loans. If that same borrower then takes ten items out on loan, space is then allocated for those ten loans, neither more nor less. As the items are returned, that space is returned to the system for re-use.

2.2 Variable data length

The REALITY/SEQUEL relational database has true variable length disc storage of data elements, records and files. Each data element occupies only its own length in disc storage; no space is wasted in storing unnecessary padding to fill data out to a fixed field size which is too long; no data need be truncated to fit into a fixed field which is too short.

Each record occupies only the space required to hold its component data elements; each file in the database is large enough only for its component records. As extra space is required, it is made available.

2.3 Lack of redundancy

Since all data for each module of a library system can share a common central database, no information needs to be held more than once. This again saves storage space and, importantly, ensures that only a single update is required to change an item, no matter in how many modules or functions it is used.

2.4 ENGLISH

Another important feature of the REALITY/SEQUEL relational database approach is that naive users authorised for access to the data can safely be given the ENGLISH high level enquiry and report generating language, since it can not be used to amend the database. This simple, indeed obvious, precaution makes ENGLISH almost unique amongst enquiry languages.

A typical ENGLISH enquiry consists of a relatively free-form sentence containing appropriate verbs, file names, data selection criteria, and control modifiers. Each user's vocabulary can be individually tailored to his particular application jargon.

ENGLISH is a dictionary-driven language which references:

- each user's master dictionary for verb definitions and file names; and
- data dictionaries for data attribute descriptions which specify attribute fields, functional calculations, inter-file retrieval operations, display formats, and more.

Any information on the database can be selectively retrieved using ENGLISH. Output records are automatically formatted for the user by the REALITY/SEQUEL system and transmitted to the terminal, but may optionally be directed to the printer. The output may be sorted into any sequence defined by the user and attributes may be totalled based on user specified control breaks.

2.5 URICA Library System

Using relational database technology it is possible to provide a fully-integrated library system covering Monograph Acquisitions, Cataloguing, Enquiry, Serials Control and Circulation on a mini-computer. This technology can support not only one library's data and activities but also the data and activities of a number of libraries. Such a system is the AMA URICA Library System which uses an AMA REALITY/SEQUEL mini-computer. This system is installed in nine libraries in Australia and more installations are due shortly. Up to 2 million titles can be accommodated in this system and up to 127 terminals can be supported.

3 Issues to be resolved for co-operative use of a system

1. Cataloguing standards:
2. Different subject classification schemes:
3. Different subject heading schemes:
4. Extent of local data:
5. Catalogues and on-line public access:
6. Library policies on loan periods, renewals, reservations, overdues, fines, etc:
7. Reciprocal borrowing rights:
8. Inter-library loans (ILL):
9. Reservations:
10. Collection development and sharing expertise:
11. External sources of MARC data:
12. Policy on "bumping" (replacement) of existing records:
13. Cost sharing.

3.1 Cataloguing standards

Standards for cataloguing have been an important consideration for library networks in the past. This generally means that agreement must be reached on whether AACR1 or AACR2 rules are to apply; and if AACR2 rules are to be followed then agreement is needed on the level of description to apply (Level 1? Level 2? Level 3?). It is also necessary to agree on which edition of a subject classification scheme is to be followed (eg. Dewey 18 or 19) and which edition of a subject headings scheme is to be used. If computer-produced outputs such as COM microfiche are to be produced then for practical purposes an agreed set of filing rules should be used. Imagine the confusion if a union catalogue was produced using the new filing rules and a local catalogue was produced using the old filing rules!

3.2 Different subject classification schemes

Although Dewey remains as a common classification scheme in Australian libraries, nevertheless even within one library there may be a requirement to use other schemes such as Library of Congress or BLISS. Within the group of libraries wishing to automate, these requirements will have to be identified and an assessment made as to how a proposed computer system would cater for this.

3.3 Different subject headings schemes

More than one subject heading scheme may be required. This implies that the same considerations as for subject classification schemes apply. One example is the use of special medical subject headings (MESH).

3.4 Extent of local data

The requirements for the local data that must be stored vary significantly between libraries. One library may wish to store acquisitions information with each record in the system. Another may have a complex scheme for unique call numbers. Many existing automated library systems lack flexibility in this area. A case in point is the Australian Bibliographic Network (ABN) where the provision for local data is extremely poor.

3.5 Catalogues and on-line public access

If COM microfiche catalogues are to be produced then consideration must be given to the sequences to be provided (Author, Title, Subject, combined Author/Title etc.; to the format to be used (single column, two columns, etc), and to the level of detail printed. (Do we really need tracings in a COM microfiche catalogue?)

When a user makes an enquiry using on-line public access should the system show all the holdings for the group when a particular title has been identified or only the holdings of the user's library? Similarly, should the system display information about all the titles on a particular subject or only for the titles held within the user's library?

3.6 Library policies and reciprocal borrowing

Consideration must be given to whether it is necessary to support different policies for each library in regard to loan periods, renewals, reservations, overdues, fines, etc.

Are reciprocal borrowing rights to be given to all the users of the group's libraries regardless of which library the user belongs to? Can items borrowed be returned to any library in the group?

3.7 ILL and Reservations

Do the libraries in the group wish to facilitate inter-library lending between themselves? Must the computer system be able to support reservations from one library on another library's books?

3.8 Collection development and sharing expertise

Collection development is assisted by systems which allow members of a group to quickly identify current availability of titles or a library's intention to purchase the sought-after item. In regard to acquisitions information there is a need to determine just how much information should be given to other libraries (eg. date ordered, number of copies, supplier, estimated price, etc).

Librarians within the group may have developed expertise in cataloguing certain materials. This can lead to other members of the group waiting upon the cataloguing to be provided by the acknowledged experts. Is this a desirable outcome of co-operative effort?

3.9 External sources of MARC data

Machine-readable cataloguing (MARC) data is now available from a number of sources (national agencies and commercial organizations). In the past 10 years conflicts have existed between data from the U.K. and the U.S. due to the different application of cataloguing rules. Agreement on preferred sources can alleviate some of the problems.

3.10 "Bumping" of existing records

Interim cataloguing records (usually created by acquisitions systems) can be either upgraded selectively or completely replaced by incoming MARC data from external sources. Agreement on "bumping" rules is essential.

3.11 Cost sharing

An essential requirement for all co-operative endeavours is an equitable system for cost sharing. Is one library's cataloguing worth more to the group than another's? Does a cost-sharing scheme based on a percentage of titles held in the system reflect the use and the value of the system to a member library with only 10% of the titles in the database?

4 System design considerations

Using the AMA UNICS Library System as an example the following components make up the total system:

- the Bibliographic Data Base (BDB);
- the Holdings File;
- the Borrowers File;
- Circulation files (such as Loan File, Reservations File);
- Monograph Acquisitions files (such as Suppliers, Orders, Funds);
- Serials Control files (such as Vendors, Subscriptions, Binding).

This is a highly simplified picture of the total system but it is sufficient to help focus attention on the main issues.

Cataloguing can be considered as the creation and maintenance of the BDB and the Holdings File. On-line enquiries are made on the BDB and displays about titles draw on the following: Monograph Acquisitions files for details of items "on-order" or "in-process"; Circulation files for details on items "on-shelf", "on-loan", or "reserved"; Serials Control files for details of "last issue received", or "missing issues for the year". There is no real limit on the variety of information that can be presented to the user in a totally integrated automated library system.

5 Possible options

In implementing a system to meet network requirements the following options are possible:

- one shared BDB or one for each library;
- one Holdings File or one for each library;
- one Borrower File or one for each library;
- one shared set of Circulation files or one set for each library.

In regard to Monograph Acquisitions files and Serials Control files, because of the differing requirements in each library in the areas of fund accounting, follow-up reports etc. it seems best to provide a set of files for each activity for every library in the group.

The following observations can be made about the listed options:

- Given the storage efficiency obtained by using relational databases and given the current costs of disc storage devices (relatively low compared to all other costs of a system) it is feasible to recommend that individual BDB's may be a viable option for libraries to consider. The advantages in this case may far outweigh the extra costs involved.

- The use of one BDB supports enquiries across all titles in the data base with one search operation. However the use of individual BDB's facilitates more rapid and perhaps more relevant retrievals based on only one library's holdings. One BDB facilitates the production of a union catalogue on COM microfiche, while individual library BDB's facilitate the production of a local catalogues on COM microfiche.

- The use of individual Borrower Files need not prevent the system from recognising borrowers from other member libraries and treating them as reciprocal borrowers. This situation would also provide a greater assurance of security over the privacy of the information held about each borrower than would be the case with a shared Borrower File.

- The use of shared Circulation files can affect such areas as the implementation of library policy, reservations and ILL.

6 Model 1 - a library network

6.1 Components

We can consider a library network to be a co-operative effort based around the shared use of one bibliographic data base on an automated system. It has the following components:

- one BDB;
- one Holdings File;
- one Borrower File;
- one set of Circulation files;
- a set of Monograph Acquisitions files for each library;
- a set of Serials Control files for each library.

6.2 Benefits

The following benefits can be derived from this model: It

- facilitates sharing of cataloguing data;
- reduces the disc space requirements (the degree of reduction is dependent on the duplication rate between the libraries - in today's economic climate of inadequate funding for libraries this may be lower than one would at first expect);
- facilitates COM production for union catalogues;
- allows enquiries to be made on all titles in the database in one operation;
- allows borrowers to be recognised immediately by the system at all member libraries and they can be banned in all of the libraries at the same time;
- facilitates system-wide reservations;
- facilitates recognition of items returned to the wrong library and allows a return to be recorded at any library;
- allows multi-level loans for ILL between members (one library is recorded as borrowing the item from another library while at the same time the item is also recorded as a loan to member of the public);

6.3 Possible disadvantages

The following may be seen as disadvantages of using the one BDB model:

- difficulties may arise in agreement on the observance of and the policing of cataloguing standards;
- disagreements may arise in regard to the appropriateness of an existing classification number (since classification numbers can be used to automatically generate call numbers this may become a sensitive issue);
- disagreements may arise in the use of certain subject headings ("Longshoremen" may be fine for one library but another may prefer "Wharfies");
- on-line enquiries may take longer to resolve due to the possiblity that many more works may be available on one subject than would be the case in a multi-BDB arrangement;
- the results of enquiries may be largely irrelevant if most of the titles displayed are not available at the library at which the user is currently making the enquiry (the user may not be prepared to go to another library to collect the items located elsewhere);
- there is an added complexity in overdues processing;
- there is an added complexity in the collection of statistics especially in regard to reciprocal borrowers;
- there is a loss of both autonomy and a degree of flexibility;
- the time taken to produce a local COM catalogue is increased;
- an added complexity exists for cost sharing; who should pay more: the library which did the original cataloguing or the library adding its holdings to an existing record?
- the costs of merging two pre-existing databases using different standards and different authority files may be prohibitive.

7 Model 2 - a computer network

7.1 Components

We can consider a computer network to be the co-operative use of a computer facility. It is used in such a way that it enables each participant to utilise the facility for its own automated system. It has the following components:

- an individual BDB for each library;
- an individual Holdings File for each library;
- an individual Borrower File for each library;
- a set of Circulation files for each library;
- a set of Monograph Acquisitions files for each library;
- a set of Serials Control files for each library.

7.2 Benefits

The following benefits can be derived from this model:

- a library's own cataloguing standards etc apply;
- libraries can share cataloguing by the use of "Copy cataloguing" (a record is copied from one BDB to another);
- it facilitates COM production for local catalogues;
- enquiries are made on your own library's holdings first (this can lead to faster searches and perhaps more relevant retrievals);
- borrowers can be given reciprocal borrowing rights by copying a record from one Borrower file to another (such records could be automatically deleted by the system after a period of inactivity);
- items returned to the wrong library can be recognised by the use of special number ranges for the accession number on each item or by the use of numbers with special prefixes which identify the owning library;
- maximum independence and the greatest flexibility prevails.

7.3 Possible disadvantages

The following may be seen as disadvantages of using the multi-BDB model:

- enquiries across the whole system can only be made by repeating the search on each data base;
- there is an increase in complexity in the production of a COM union catalogue;
- reservations for users are only made in their own library exclusively on its holdings;
- items returned to the wrong library will not have their loan records cleared until they arrive at their correct location;
- there is a possible increase in disc space requirements.

8 Joint ownership or bureau use

Access to a computer system may be achieved by one of the following methods:

- joint purchase of a system (it may be feasible with only 5 libraries);
- one library purchases the system and offers bureau services to the other libraries;
- a commercial organization purchases a system and offers bureau services to the libraries (this may appeal to book suppliers and to serials subscription agencies).

8.1 Advantages of a co-operative venture

Some of the advantages to be gained out of co-operative venture between libraries in a region or libraries of a similar type are:

- a much earlier start along the automation path;
- shared costs for the initial system and for any future enhancements;
- sharing of cataloguing data;
- sharing of expertise;
- collection development is facilitated;
- improved services to library users.

9 Communications costs

Libraries contemplating establishing a computer-based network are advised to acquaint themselves with the communications costs which can be quite substantial. Costs which must be borne in mind relate to:

- telecommunication lines
- multiplexors
- modems.

Terminals remote from the building housing the computer need to be linked to the system via a communications line. A number of terminals can use the one line but this sharing of a line requires a multiplexor. The multiplexor is attached to the communications line via a modem, and the line is attached to the computer via another modem.

Generally speaking, the higher the speed of the communications line then the higher the annual rental costs. Terminal response times are affected by the line speed, the number of terminals attached to that line, and the type of multiplexor used. A terminal operating at less than 1200 BAUD will most likely be totally unacceptable for most applications.

10 Micro-computers

The use of micro-computers for library systems is an area which has not been well served to-date. However, exciting developments are under way in Australia and New Zealand. The main constraints on the use of micro-computers for libraries have been:

- limited disc storage
- limited number of terminals
- limited CPU processing power
- limited software.

A small library of 20,000 titles may require at least 10 MB (megabytes) of disc storage just for the bibliographic descriptions. That same library could profitably use at least 3 terminals (1 each for cataloguing, enquiry and circulation). And when the library's users begin to use the on-line catalogue the demand for terminals can be expected to increase dramatically. Furthermore, after the library staff become quite familiar with on-line cataloguing, enquiry and circulation it is reasonable to expect that a demand for other functions to be also available on-line will occur (functions like monograph acquisitions, serials control, SDI, special indexing etc). But is there enough processing power in the CPU? Can new software be quickly developed and existing software modified to meet the changing requirements of the library? All the above mentioned constraints can be overcome through the use of the REALITY/SEQUEL mini-computer.

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